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Pig Iron Prices Are Firmer

As Buying Becomes More General—Cast Pipe and Other Melters Expected to Order Large Tonnages

Improvement in the pig iron market is spreading throughout the country. While tonnages purchased during the past week have not been in as large orders as those recently booked by Buffalo furnaces, both inquiry and buying are more general and prices are showing increasing firmness. Fully 20,000 tons of foundry and malleable iron are pending in the Pittsburgh district and leading companies are adhering firmly to $13, valley, for No. 2 foundry. The General Electric Co. has sent out an inquiry for 5,000 tons of basic for delivery during the first half of next year, but it is understood that it may take a considerably larger tonnage. There is more buying in the Philadelphia district and furnaces are not so free to sell at recent low prices. Low phosphorus iron is more active in that district and one firm has an inquiry for 10,000 tons. The leading cast iron pipe and some smaller pipe concerns have appeared in the market. While improved demand continues at Cincinnati, southern foundry No. 2 has sold in that market at $9.75, Birmingham, for No. 2 foundry, and southern Ohio iron at $12.75, Ironton, a decline in each case of 25 cents as compared with the recent prevailing prices.

Tubular Goods

A leading maker has reduced prices on oil well pipe about 5 per cent, or $1 a ton. Quotations on boiler tubes have not been officially changed, but considerable shading is being done on desirable business.

Iron Ore

The depression which has prevailed in the iron trade throughout the year is clearly reflected in the shipments for the year, the total being 32,020,487 tons, as compared with 49,070,478 in 1913. An important development in the ore trade is the contract just made, by which M. A. Hanna & Co. become the selling agents for the Great Northern ore properties, of which the Steel Corporation lease expires Jan. 1. It is estimated that the ore deposits of the Great Northern lands are nearly a half billion tons.

Plates

The Steel Corporation mills will roll from 13,000 to 16,000 tons of plates for a water line at Coolgardie, Australia. There is considerable activity in shipbuilding plants, where some merchant projects have been revived and numerous inquiries from abroad, including some torpedo boats, are pending.

Shapes

Demand for structural material has improved in some centers, but competition is very keen and low prices are being made. Several foreign countries are already investigating as to terms upon which extensive purchases of bridge material for reconstructing bridges destroyed during the war can be made.

Scrap

Improvement in the scrap market is noted at Pittsburgh, and in Cleveland and other centers the market is tending upward. So far, however, there has been very little advance over the very low quotations which recently prevailed.

Pig Iron Production

The production of coke and anthracite pig iron for November was 1,512,972 tons, a loss of 254,255 tons compared with October. The November output is the smallest of any month since September, 1908. The number of stacks active on the last day of November shows a loss of 11 during the month.

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Practical Men Demanded

WHEN the Federal Trade Commission bill was being considered in the Senate, it developed that there was a wide difference of opinion as to what its effect would be. Senator Reed, of Missouri, in the course of a speech, said, "We are of different views of thought here in the Senate. Some of us believe that the trade commission bill, as it is now formed, with no substantive law back of it, save the expression 'unfair competition is hereby prohibited', will be a body either possessed of unlimited authority, and, therefore, a body that may strike down the wholesome laws we now know we possess, or else a body that will possess such limited authority that it can proceed nowhere except where it has a law to guide it and, therefore, cannot add one line to the law." This statement of the Senator is one of many that might be quoted as showing the possible effects of the interpretation to be placed on the law by members of the commission and by the courts. Hence it is a matter of great importance that the members of the commission shall be men eminently qualified to discharge their duties.

In the report made by the conference committee of the two houses of Congress, it was declared that the certain way to stop monopoly at the threshold is to prevent unfair competition, and that this can be best accomplished "through the action of an administrative body of practical men, thoroughly informed in regard to business, who will be able to apply the rule enacted by Congress to particular business situations so as to eradicate evils with the least risk of interfering with legitimate business operations." In other words, the demand of the hour is not for theoretical men of any kind who are not familiar with actual business.

There is no doubt that the new federal reserve banking system has been inaugurated under auspicious circumstances, with the confidence of the country, largely on account of the high character of the men appointed to membership of the board. One man, Paul Warburg, stands as a tower of strength on account of his great ability, his practical experience and his willingness to make large financial sacrifices in order to participate in a highly important constructive undertaking. The appointment of a Warburg on the trade commission would do more than anything else at the present time to quiet fears as to the effect on business of the decisions of the new commission. Naturally, a man of that type will not seek the position, but we believe it would be entirely proper and patriotic for business men of the country, as individuals or as members of different organizations, to assist the President in organizing this very important commission. Apparently, up to the present time, business men have done little, or nothing, in this direction. Would it not be well for them to begin at once a search for men of the highest type who will be willing to sacrifice their business interests to serve their country, if called upon by the President to do so?

What Will Colorado Do?

A MINISTER of the gospel, Rev. A. A. Berle, of Cambridge, Mass., has spent ten days in Colorado, investigating the mining situation in that state, and has come to the conclusion that, "The amount of falsehood which has been spread over the land concerning the strike is the outstanding feature of the whole business." This fact certainly impresses anyone who has become familiar with conditions in Colorado and has read any considerable number of the newspaper and other accounts relating to the deplorable industrial struggle. The principal center of mendacity seems to be the headquarters of the union in Denver, which has been sending out many statements invented to prejudice public opinion against the operators. Unquestionably, many of these statements are made deliberately by men who know they are false, but even men who are trying to tell the truth do not agree as to what the facts are in Colorado.

Rev. Mr. Berle has come nearer than another ministerial gentleman to the correct appreciation of conditions in Colorado. He says the strike was not the act of the mine workers of Colorado in the first instance, of which the proof is pretty clear from the fact that less than one-third of them responded to the call.

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He declares that the so-called strike was brought on by an outside organization and was an invasion which was not justified by the conditions. The assumption, he says, that it represented the mine workers actually in the employ of the companies when declared is utterly unjustified by the evidence. "The invasion of the state," says Mr. Berle, "by what amounts to an armed force, breeding and carrying on destruction through force, is the real issue at stake, and that the United Mine Workers of America deliberately undertook to do this, and have done it, is my solemn conviction from a study of all the facts."

The other ministerial investigator referred to, Rev. Henry A. Atkinson, of Boston, whose report has just been made public, commends the operators for some things they have done, but seems not to comprehend why they are so firmly opposed to the United Mine Workers. He declares that the mining companies deny their workers the right of membership in any organization which is strong enough to affect working conditions to any degree. This is not the attitude of the operators as we understand it. They are opposed to the United Mine Workers because that organization is lawless and has shown itself as being utterly unworthy of recognition. Referring to the so-called battle of Ludlow, of April 20, 1914, Mr. Atkinson asserts that it was the Ludlow colony against which the militia, including the mine guards, directed their fire. In his recent report to the stockholders of the Colorado Fuel & Iron Co., President Welborn stated that by the middle of April all but a small detachment of the National Guard, consisting of less than 50 men, had been withdrawn, and they were stationed at and in the vicinity of Ludlow, where they were attacked on April 20 by the strikers and their leaders from the tent colony by a force ten times that of the soldiers. "Without question," says Mr. Welborn, "the women and children who lost their lives in this affray were smothered in a covered cave, through the foolish, if not criminal, act of their own men, who put them there and sealed the cover with dirt. Horrible as were these deaths, none of the bodies showed any evidence of being shot." Clearly, Mr. Atkinson was misinformed as to the facts.

Regardless as to how men may differ as to various crimes and incidents connected with this strike, there ought to be general agreement as to the duty of the state of Colorado to assert itself and guarantee the maintenance of order within the state. Threats have been made that as soon as the federal troops are withdrawn, the strikers will attack the state militia, if the militia should be recalled to the mines. But surely the great state of Colorado will not permanently put itself in the humilitating attitude of not being able to defend its own citizens against the small band of vicious strikers and their union supporters.

The latest development in regard to the Colorado situation, the appointment of a commission by President Wilson, came as a surprise, for it was understood that the commission idea was not approved by the operators. However, it is earnestly to be hoped that operators and miners will co-operate with the commission in an effort to settle the industrial controversy which has been so long continued.

A subscriber in Milwaukee mails us a copy of the *Pottery and Glass Record*, a British publication, and suggests that the subscriber at Nice, France, referred to in THE IRON TRADE REVIEW of Nov. 19, in an editorial on "Neutrality and Expression of Opinion", can get the necessary consolation from articles published in this organ of the pottery and glass trade, which show that British manufacturers of pottery and glass are not asleep, but are doing all in their power to capture trade in those lines which heretofore has been enjoyed by Germany and Austria. Makers of pottery and glass are not the only manufacturers in Great Britain who are endeavoring to capture trade which has formerly gone to Germany and Austria. The iron and steel manufacturers are also busy. We imagine that even in France efforts are being made to get business which under other conditions would go to the present enemies of the allies. In many directions, the currents of commerce will be changed, and to some extent the change will be permanent.

Prices Present and Past

Quotations on leading products today, average for last month, average for three months ago and average for December 1913. Prices are those ruling in the largest percentage of sales at the dates named.

	Today's prices.	Average for Nov., 1914.	Average for Sept., 1914.	Average for Dec., 1913.
Bessemer pig iron, Pittsburgh	$14.70	$14.70	$14.90	$15.90
Basic pig iron, Pittsburgh	13.45	13.45	13.90	13.71
No. 2 Fdy. pig iron, Pittsburgh	13.70	13.70	13.80	14.36
Northern No. 2 Fdy., Chgo.	13.00	13.00	13.50	14.50
Lake Superior Charcoal, Chgo.	15.75	15.75	15.75	15.50
Malleable, Bessemer, Chicago	13.00	13.00	13.50	14.50
Southern No. 2, Birmingham	10.00	10.00	10.00	10.75
Southern Ohio No. 2, Ironton	13.00	13.00	13.00	13.50
Basic, eastern Pa.	13.50	13.50	14.00	14.25
No. 2X Virginia furnace	12.50	12.50	12.50	12.75
No. 2X Foundry, Philadelphia	14.25	14.25	14.75	15.00
Ferro mang., Balti.	68.00	68.00	80.00	47.00
Billets, Pbgh.	19.00	19.00	21.00	20.00
Sheet bars, Pbgh.	19.50	19.62	22.00	21.00
Steel bars, Chicago	1.25	1.25	1.38	1.38
Steel bars, Pittsburgh	1.05	1.10	1.20	1.31
Iron bars, Philadelphia	1.15	1.15	1.17	1.27
Iron bars, Cleveland, local del'y.	1.15	1.20	1.20	1.30
Iron bars, Chgo. mill	.95	.975	1.07	1.15

	Today's prices.	Average for Nov., 1914.	Average for Sept., 1914.	Average for Dec., 1913.
Beams, Chicago	$1.25	$1.25	$1.38	$1.38
Beams, Pittsburgh	1.05	1.11	1.20	1.25
Beams, Philadelphia	1.25	1.25	1.30	1.35
Tank plates, Pittsburgh	1.05	1.09	1.18	1.18
Tank plates, Chicago	1.25	1.25	1.38	1.33
Tank plates, Philadelphia	1.25	1.25	1.30	1.40
Sheets, blk., No. 28, Pittsburgh	1.85	1.89	1.95	1.88
Sheets, blue an., No. 10, Pbgh.	1.35	1.39	1.40	1.40
Sheets, galv., No. 28. Pbgh.	2.85	2.86	2.95	2.87
Wire nails, Pittsburgh	1.55	1.59	1.55	1.55
Connellsville fur. coke, contr.	1.65	1.65	1.75	1.81
Connellsville fdy. coke, contr.	2.25	2.25	2.35	2.54
Heavy melting steel, Pbgh.	10.00	10.06	11.44	11.00
Heavy melting steel, east'n Pa.	9.50	9.50	10.50	10.00
Heavy melting steel, Chgo.	8.00	8.25	9.37	9.00
No. 1 wrought eastern Pa.	11.50	11.00	12.50	13.00
No. 1 wrought, Chgo.	7.50	7.50	8.31	8.50
Rerolling rails, Chgo.	9.50	9.50	10.87	11.50
Car wheels, Chgo.	10.00	10.00	10.75	12.25

(For Additional Prices See Page 1060.)

Pig Iron Activity is Spreading

About 20,000 Tons Pending at Pittsburgh—Leading Cast Iron Pipe Company Enters the Market—Increased Buying General

Pittsburgh, Dec. 1.—Activity in the pig iron market, which gradually extended from the eastern seaboard to Chicago, along the northern boundaries of the United States, now is being enjoyed in the Greater Pittsburgh district. Consumers of steel making and foundry grades, apparently believing that prices have reached their low point, are actively figuring requirements for first and second quarters. The General Electric Co., which entered the market 10 days ago for 5,000 tons of first half basic, may buy 20,000 tons, if sufficiently attractive prices are offered, according to reliable reports at this center. Tonnages will be consumed at plants at Erie, Pa., and Schenectady, N. Y. A local basic consumer, who figured in the market 10 days ago, now is inquiring for an attractive tonnage, and several other melters are quietly negotiating for future needs. The American Steel Foundries, it has developed, bought 15,000 tons of basic, for plants at Sharon, Pa., Alliance, O., 10,000 tons of which was obtained at less than $12.50, valley. A radiator interest is asking prices on 1,500 tons of foundry iron for first half delivery; a machine maker is figuring on first half requirements, estimated at 2,500 tons of foundry iron, and numerous other foundry concerns are quietly covering needs. In the aggregate, it is estimated, fully 20,000 tons of foundry and malleable are under negotiation. Leading foundry iron dealers are asking $13, valley. Both Bessemer and basic pig iron registered declines last month, according to figures compiled by W. P. Snyder & Co., who today announced the average price of Bessemer as $13.6375 and of basic as $12.477, valley furnace, for November. Averages are based upon sales of 1,000 tons or more. Compared with averages for the preceding month, Bessemer and basic last month declined 30 cents and 37 cents, respectively. Compared with averages for the corresponding month a year ago, Bessemer and basic declined $1.4870 and $0.536, respectively. Bessemer, which dipped below the published price of $13.75, valley, last month, has sold at $14, valley, the last couple of days. One 1,000-ton lot of special analysis basic pig iron has sold at $12.75, valley. Blast furnace managers express the opinion that buying will continue active through this month.

Better Market at Philadelphia.

Philadelphia, Nov. 30.—A more encouraging degree of buying and of inquiry is being maintained in the pig iron market in this territory. Consumers, especially the foundries, now are coming freely into the market. While prices are unchanged, some eastern Pennsylvania producers show less willingness to offer recent quotations, without reserve, now that Buffalo competition in this territory has been eliminated by the advancing schedules there. For standard No. 2X foundry, $14.25 to $14.50, Philadelphia, still is being done, equivalent to $13.50 to $13.75, furnace. Central Pennsylvania makers are manifesting greater determination to avoid $13 furnace, for No. 2X. Virginia iron still shows the spread of $12.25 to $12.75 furnace, for No. 2X. Sales of the week include 3,000 tons of No. 2 plain to a Lansdale buyer at $13.75 and $13.80 delivered; 500 tons to the Baltimore & Ohio railroad for various shops; some tonnage of Alabama iron to a Baltimore soil pipe maker and numerous smaller lots. The Norfolk & Western railroad still negotiates for 4,000 tons for mixed grades and the Pennsylvania railroad has withdrawn most of a small inquiry for special grades for Altoona, though it bought some iron. A Schuylkill valley buyer asks 1,000 tons and a Reading shop 600 tons of foundry grades. Delaware river pipe

(*For complete prices see page* 1060)

makers are showing more interest in iron and a report is current that one of the largest buyers has taken on a tonnage of Alabama metal. A local broker has put out an inquiry for 35,000 tons of 2.80 silicon foundry iron for export, but the trade does not expect much to develop from this matter. Low phosphorus iron is more active. One seller has total inquiry for about 10,000 tons, the principal lot being 3,500 to 4,000 tons for first half for the Midvale Steel Co., Philadelphia. Small sales are more numerous, lots having been closed for Pittsburgh, Chester, Harrison, N. J., and other points. Makers of standard iron show more willingness to meet the market as defined by recent competition at $19 to $20, Philadelphia. Lebanon brands continue at $16 to $16.50, furnace. It continues to be shown that $13.50 delivered, eastern Pennsylvania represents the basic market. It is learned that one good-sized sale was closed quietly some days ago upon this basis, under circumstances which were of some advantage to the seller, an eastern steel maker.

Pipe Makers Negotiating

New York, Dec. 1.—Negotiations for low grade iron by cast iron pipe makers are attracting considerable attention at this market center. The United States Cast Iron Pipe & Foundry Co. has entered the market for a heavy tonnage both for northern and southern plants and is understood already to have closed for a considerable amount. It is expected to take a round block of both northern and Alabama metal before the present negotiations are closed. A Phillipsburg, N. J., pipe foundry also is figuring and has asked prices up to 8,000 tons of No. 2 plain and forge. Various reports are afloat as to the amount it has purchased to date, but only 2,000 to 3,000 tons actually have been taken. It is known that on 1,000 tons of No. 2 plain taken, $13.75, delivered, was shaded. The foundries in this territory continue to put out a fair tonnage of miscellaneous inquiry but the volume of sales is not as large as recently, when Buffalo makers were soliciting business at attractive prices. An interesting feature of the situation is the number of requests for immediate shipment of iron originally purchased for first quarter delivery, indicating the small stocks held by consumers. Certain Buffalo makers who first advanced to $12.75, furnace, for this year's shipment and $13 for beyond Jan. 1, now have established their minimum at $13, furnace, and report some sales on this basis. With higher prices at Buffalo, the tidewater market appears firmer at $14 to $14.25 for No. 2X. One inquiry for 500 to 1,000 tons of foundry is current as well as a number of smaller lots. Canadian consumers have been putting out some small inquiries here including 360 tons of foundry and several hundred tons of low phosphorus. The American Car & Foundry Co., it is learned, was the purchaser recently of a considerable tonnage of foundry and malleable for its various plants. Some of this business went to Buffalo makers.

Buying Checked

Buffalo, Dec. 1.—The heavy selling in the Buffalo market a week ago has caused the disappearance of iron under $13. All the local furnace interests are firm in demanding $13 and upward for all grades, the prevailing quotations on No. 2X foundry being $13.25 for delivery over first quarter. Furnaces are not inclined to quote on second quarter deliveries except on a further advance in prices.

The advance in price and the unusual booking of last week have checked buying for the time being to the extent that sales during the week totaled about 12,000 tons of all grades.

Iron under contract is being moved out in steady volume from the plants of the district and in many cases the delivery specifications are followed up with urgent requests to have shipments traced, showing the need of the consumers for material. Buying had been put off for so long a period that many users are facing a situation where they find that their stocks on hand are practically exhausted.

Continued Activity

Cleveland, Dec. 1.—A steady stream of inquiries for all grades of pig iron has been coming to Cleveland offices during the past week, and sales of fair volume have been made. Of course, Cleveland agencies have not participated in large transactions to the extent that they did at Buffalo about a week ago, but the business which is coming in is just as encouraging as is the placing of larger tonnages, because it shows a general desire to contract and perhaps the best feature of the present situation is that shipments are going forward steadily on contracts. As an example of the character of business pending, one firm reports among other inquiries the following, all for delivery during the first half of the year: 5,000 tons northern foundry No. 2; 1,200 tons northern No. 2 foundry; 300 tons of southern foundry; 1,000 tons of northern No. 2 foundry, all for delivery in Ohio outside of Cleveland; 1,000 tons of No. 2 foundry for Cleveland delivery and 500 tons of Bessemer. In one case in which an inquiry for 500 tons No. 2 foundry was sent in, an order for 750 tons was placed. Sometimes when prices are named acceptances are received by telegraph. Cleveland furnaces are selling on the basis of $12.75 furnace for No. 2 foundry for outside delivery, which frequently makes lower delivery prices at Ohio points than the $13 furnace price which is being adhered to by leading valley interests. On the whole, the situation is considered very favorable and if deliveries on contracts continue to go forward as they are at present, a considerably firmer market may be expected.

Lower Quotations

Cincinnati, Dec. 1.—Following a week of more activity in the pig iron market than at any time this year, quotations on both southern and southern Ohio No. 2 foundry iron are being made at about 25 cents per ton lower than was the case about two weeks ago. This lower priced iron, however, is very limited as to makes and amounts obtainable. Some southern No. 2 foundry iron is obtainable at from $9.75 to $10, Birmingham basis, per ton, for immediate delivery, but the majority of furnaces are holding at the higher figure. A small amount of southern Ohio No. 2 foundry iron is also being offered at from $12.75 to $13, Ironton basis, for December shipment. The tonnage booked last week was the heaviest at any time this year and will probably make November the best month in the pig iron market since last January. Very few new inquiries, however, have come out this week and it looks as though this may have been a spurt, although from the outlook December should be better than either September or October. The Terre Haute Malleable Iron Co., Terre Haute, Ind., has closed for 3,000 tons of malleable iron, first half delivery, and several sales of equal importance and of a more secretive nature have been scattered throughout this territory. Sales to local melters include 1,500 tons to the Modern Foundry Co., 900 tons to the Monitor Stove & Range Co., and 600 tons to the Elmwood Castings Co. The L. Schreiber & Sons Co., of this city, is in the market for 1,500 tons of foundry iron, this being the principal local inquiry before dealers.

Looking Up

St. Louis, Nov. 30.—Pig iron and all of its allied lines are looking up in the St. Louis market, and dealers are really optimistic that a good buying movement is near. Inquiries for pig iron are out today as follows, larger than they have been for a long

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time: Basic, 2,000 tons; malleable, 1,000 tons; southern No. 2, 500 tons; southern No. 2, 200 tons, all for delivery over the first and second quarter of next year.

Southern No. 2 is still offered at $10 to $10.25, Birmingham. Northern iron is quoted at $13, Chicago, and $13, Ironton.

Chicago Prices Stronger

Chicago, Dec. 1.—Activity in the pig iron market, which began about 10 days ago, is continuing without cessation and a large tonnage is pending on inquiry from many melters, while an equally large tonnage already has been booked for first quarter and first half delivery. A feature of the inquiry is that users of malleable iron, for the most part dependant on railroads and agricultural implement makers, are not buying as heavily as users of foundry grades. Sales thus far have been sufficient to cause prices to become firmer and nothing under $13, Chicago furnace, for No. 2 foundry and malleable, is being heard. Indications are that before the week is out, unless the activity should cease suddenly, prices will be advanced 50 cents per ton by all sellers.

The Iroquois Iron Co. has blown out furnace "C" at its South Chicago plant. The reason given is that the company prefers an idle furnace rather than continue to sell the output of two furnaces on the present low market.

Sellers of southern iron are participating in the present activity of the market and considerable tonnages are being contracted for next year's delivery in territory tributary to this city. While iron has been sold in the recent past on the basis of $9.75, Birmingham, the price has firmed to $10, Birmingham, for immediate delivery and some makers are holding steadily for $10.50, Birmingham, for first quarter and first half delivery.

A melter of basic iron near St. Louis recently entered the market for about 10,000 tons, but later withdrew without buying.

Makers of pig iron in this territory are of the opinion that the present buying movement is based on actual business and that it will continue, but are holding themselves well in hand, so that if the unexpected happens and buying subsides, they will be in excellent shape to meet that contingency. Inquiries range from 3,000 tons down to single carloads, with the majority under 1,000 tons.

Probably in excess of 20,000 tons are represented in the present active inquiry, the great majority of which is for foundry grades.

Embargo Still Holds

On Ferro-Manganese Shipments Except When Licenses Are Granted Under Strict Conditions

New York, Dec. 1.—Licenses to ship ferro-manganese to this country apparently now will be granted by the English government, only in certain cases and after strict adherence to a rather elaborate set of prescribed conditions. For the most part, however, the embargo still maintains and sellers are able to offer material only subject to their ability to ship. The price at which this provisional business is being solicited, remains $68, seaboard. Sellers are showing more determination to straighten out the present uncertain situation and greater efforts in this direction with the co-operation of the United States government are expected.

One eastern merchant reports having been granted a license to bring in a considerable tonnage this month and in this case it was necessary to show a shipping contract previously arranged, the contract of sale and to give assurance that the material was intended for consumption in this country, before the authority was allowed. It appears that where sellers previously have made freight arrangements for specific shipments to this country, they are in a more favorable position to obtain licenses from the English government. Some agents of English makers are showing some concern in their December deliveries, since up to this time they have not received from their principals any notice of sailing, which usually is on hand by this time. The present outlook for December arrivals is uncertain. A small tonnage came in at New Orleans this week, but this left England before the embargo was put into effect.

The market is not active, but is firm in price at $68, seaboard. Investigation proves that a sale of 100 tons at $62, seaboard, recently reported, was due to a clerical error on the part of the sellers in England in cabling the quotation. This transaction actually was made at this figure, due to the error, but since then further and larger sales have been made at $68, seaboard, which represents the present market. As stated, some sellers are offering material for shipment up to July 1 at this price subject to their ability to make the proper arrangements to ship. A Philadelphia steel maker is in the market for 300 tons of ferro-manganese for first quarter.

The Steel Corporation, it is understood, has informed some consumers of ferro-manganese that it will be able to take care of their requirements, but, as far as known, this maker has not made any quotations.

An eastern Pennsylvania steel foundry asks 1,200 tons of Bessemer ferrosilicon and another inquiry for 200 tons of this product by a Philadelphia steel maker has been satisfied. The latter buyer also is understood to have bought 200 tons of spiegeleisen from the Dunbar furnace.

Unique Proposition

Washington, Dec. 1.—Unusual interest is being manifested in a proposal just submitted by Great Britain with regard to lifting the embargo on manganese ore and other products. It is assumed that ferro-manganese is included in the list, although no official advices are available to confirm this belief.

Great Britain has advised that she will lift the embargo on the products mentioned provided the United States will refrain in the future from protesting against England stopping shipments of copper, petroleum, rubber and hides, intended for nations hostile to Great Britain. The plan is unique and nothing has been found in international law to justify the United States in entering into the pact.

Acting Secretary of State Lansing, however, denied any knowledge of such negotiations being under way. He pointed out that the United States could not make any such pledge to Great Britain.

Store Prices

Have Been Marked Down in the Philadelphia District

Philadelphia, Nov. 30.—Store prices in this territory are about $1 lower in conformity with the reduced quotations of the mills. Shapes and plates are selling at 1.60c, steel bars at 1.65c and bar iron at 1.50c to 1.55c, all for local delivery. Warehouse business in this territory is only fair.

Demand for Reinforcing Bars

Cincinnati, Nov. 30.—Warehouse business continues to hold its own and has been unchanged for about two months. Demand is chiefly for concrete reinforcing bars and will probably remain so until cold weather sets in. Orders are uncertain and scattered, being good one day and poor the next. Prices show no tendency to change and will probably not do so until the first of the year.

(For complete prices see page 1060)

Sheets Are More Active

In Some Centers Than for Several Months—Poor Trade in the East

Pittsburgh, Dec. 1.—Several important manufacturers of steel sheets in this territory advise that buying has been more satisfactory the last 10 days than during any similar period for several months. While single tonnages have not been large, yet demand has been general. On tonnages for forward delivery, makers are quoting maximum prices, but some mills continue to offer attractive concessions for immediate shipment. Mill operations remain low, and no great change in rolling schedules is expected this month.

Poor Sheet Trade in East.

Philadelphia, Nov. 30.—Sheet bookings with eastern makers continue light. While the orders are quite numerous, they represent but little weight. New offerings are small. Prices incline towards softness. The open market is 1.50c, Philadelphia, or 1.35c, Pittsburgh, for No. 10 gage blue annealed, but this figure has been shaded and probably still could be, on an attractive order. Sheet mill operations in this territory are very satisfactory to producers.

Slightly Stronger

Chicago, Dec. 1.—The unusually low quotations which have been prevailing for black sheets, as low as 1.99c to 2.09c, Chicago mill, for No. 28 gage, seem to have brought sufficient tonnage to some makers to retire the minimum figure and at present black sheets are obtainable at a range from 2.09c to 2.14c, Chicago mill, for No. 28 gage. Galvanized sheets remain practically unchanged with 3.04c, Chicago mill, an average quotation for No. 28 gage. Some tonnages are being disposed of $1 per ton lower than this figure and occasionally a sale is made at $1 per ton higher.

Mills in and near this city have comparatively small tonnages on which to work, but are standing pat on their quotations as far as possible.

Kentucky Plants Reopen

Cincinnati, Nov. 30.—The plants of the Andrews Steel Co. and the Newport Rolling Mill Co., both of Newport, Ky., and operated under one management, have reopened again with full force of from 1,200 to 1,400 men after a short shut-down of a few weeks for repairs. The plants will now be operated in all departments until the first of the year. Specifications for sheets are a little heavier than at any time this month and the general feeling in the market is better. Prices show a strong tendency to stiffen and dealers believe that an advance will come before the end of December. Orders are mostly for small lots and are scattered, but the aggregate is fairly satisfactory. Black sheets No. 28 gage are quoted at 2.058c and galvanized No. 28 gage at 3.058c, both Cincinnati basis.

Plates for Many Ships

Are Involved in Pending Inquiries—Torpedo Boats May Be Ordered by Warring Nations

Philadelphia, Nov. 30. — There is considerable talk of shipbuilding work now pending before eastern yards and it is apparent from the interest shown in plate requirements that a large tonnage is involved. There is some inquiry for torpedo boats from the warring nations and one report of the number of such craft that may be bought is sixteen to eighteen. An eastern shipbuilder asks immediate quotations for estimating purposes on 1,800 tons of universal and sheared plates, 2,050 tons of 6-inch and smaller angles, 350 tons of channels and 150 tons of beams. It is understood that some of the shipbuilding programs of American companies which have been talked about for some months now are being revived. The tank steamer for the Standard Oil Co. requiring 3,000 tons of plates is unplaced. Eastern plate makers are doing a little better business, but the gain is slow. One plant reports its operations at better than 50 per cent. There is more desire among buyers to contract which the mills do not encourage. Eastern mills are standing more firmly for 1.25c, Philadelphia, or 1.10c, Pittsburgh, and will not equal the lower prices reported in other districts.

Show Weakness at Chicago

Chicago, Dec. 1.—Following a tendency to drag behind other finished steel products, steel plates at present are selling somewhat lower than other forms in this market. Determination of steel mills in the west to protect their market against eastern material has led to the freight differential being disregarded to some extent and steel plates have been sold at about 1.20c, Chicago mill, which would figure back to a trifle more than 1c, Pittsburgh. A considerable tonnage was disposed of to a western railroad within the past few days at a figure close to this mark. Under present conditions, makers of plates in this district see no reason for maintaining the freight differential at the expense of tonnage when the latter is their greatest need.

New business in steel plates is small and in the absence of car buying and other factors the ruling quotation, 1.25c to 1.34c, Chicago mill, is largely nominal.

Slight Betterment at New York

New York, Dec. 1.—The United States government has asked bids on about 1,000 tons for fuel oil storage tanks to be built at various points. There is more talk of ship building work in prospect in this territory and a number of projects other than a tank boat for the Standard Oil Co., previously mentioned, are showing life. Some of this business is understood to be for export. The 13,000 to 16,000 tons of plates for a water line for Coolgardie, Australia, recently reported as having been in the market, has gone to Steel Corporation mills. The plate market in this district appears slightly better. An inquiry for 500 tank cars for the Union Tank Line is receiving attention. Prices seem more even at 1.26c, New York, or 1.10c, Pittsburgh.

Plates for Shrapnel

A manufacturer of shrapnel cases has sent a Cleveland plate mill an inquiry for plates to manufacture from 100,000 to 500,000 cases for delivery throughout the year 1915. The inquiry is so indefinite as to tonnage required and deliveries are over such a long period, that it is doubtful whether any quotation will be made.

The W. & R. Iron Works, a corporation trading as the Colonial Iron Works, at 449 West Twenty-first street, New York City, has made an assignment to Samuel B. Pollak. Adolph Rosenbaum is president of the company.

(*For complete prices see page* 1060)

Good Prices for Scrap

Are Offered by Buyers in Italy—Domestic Demand in Some Centers Improves

Philadelphia, Nov. 30.—Buyers of old material in Italy, who have been sounding the eastern market have offered $13.50, delivered, for heavy melting steel. At normal freights, this price would figure back about $11.50, Philadelphia, which would represent a handsome margin at the current market, but the best rates of 20 to 25c now quoted, are prohibitive. A block of 7,000 tons of Panama canal scrap consisting of 5,000 tons of steel mill material, 1,000 tons of grate bars and 1,000 tons of brake shoes, which has been on dock in this city, has been sold to a New York dealer at a reported price of about $8.50, docks, and will be applied against old orders, it is understood. The market is in better tone and apparently is making some progress.

No. 1 heavy steel seems firm at $9.50, delivered, minimum, two eastern Pennsylvania works offering this figure while a western New Jersey buyer paid $10, delivered, for special material, and still negotiates. No. 1 railroad wrought is higher, a sale of 250 tons at $11.75, delivered, being noted. Small lots of car wheels have brought $10.50, delivered. A pipe maker offers $12, delivered for heavy cast, but this is above the market. Shafting and low phosphorus are scarce. There are offers of $13.50, delivered, for the latter.

Scrap Looking Upward

Pittsburgh, Dec. 1.—The scrap market, in the dumps for 12 months, shows actual signs of improvement. Heavy melting steel, which had been named at $10, has sold as high as $10.75 to a Youngstown consumer. Most of the material controlled by jobbers was obtained at considerably above prevailing prices, and it is not believed much tonnage will be offered until prices advance sharply. Consumers, most of whom have not been interested in the market for six months or longer, are beginning to solicit quotations.

Better Effect Not Felt

Cincinnati, Nov. 30.—No improvement can be noted in the iron and steel scrap market despite the fact that jobbing foundries report a heavier melt than for several months and that the plant of the Andrews Steel Co., Newport, Ky., which is one of the largest users of scrap iron in this territory, is now operating full force and will continue to do so until the first of the year. This can be explained, however, in that the surplus of old material available in dealers' yards and throughout the rural districts has accumulated in such large proportions that it will take a long period of activity before any effect can be noticed. Demand is centered mostly upon No. 1 cast, cast borings and machine shop turnings. More orders are being placed outside of the city than with local melters. Prices are very uncertain, as separate quotations are being made on almost each sale, independent of others.

Expect Large Lists

St. Louis, Nov. 30.—Not much scrap is changing hands, but dealers are strongly of the opinion that improvement is not far away. Prices are unchanged from last week. No lists are out today, but there probably will be some large ones to close after Dec. 1.

Stationary at Chicago

Chicago, Dec. 1.—While iron and steel scrap remains stationary, apparently at the bottom of the market, some dealers profess to believe a movement toward higher levels is imminent and are willing to buy at the present prices. This has not affected the market materially and no advance has been registered. Mill operations have not increased and the consumption of scrap is about the same as has prevailed during the entire fall. Some dealers have contracts yet unfilled and a small tonnage is being moved.

The Chicago & North-Western railway offers approximately 10,000 tons of scrap, of which 1,000 tons are No. 1 wrought, 700 tons No. 1 cast and 400 tons of 50-pound relaying rails. Geo. W. Jennings, agent, offers 691 tons of miscellaneous railroad scrap; the Baltimore & Ohio railroad has issued a list of 14,500 tons, much of which will be disposed of in the east.

Railroad List

Chicago, Dec. 1.—The St. Louis & San Francisco railroad has issued a list containing 685 tons of scrap, which will be offered at St. Louis, Dec. 4.

Large Tonnage Sold at Buffalo.

Buffalo, Dec. 1.—The long lull in the scrap market has been broken at Buffalo by the sale of 40,000 tons of wrought and cast iron and steel, old car wheels, axles, etc., by the Erie railroad to a syndicate of dealers of New York City and Philadelphia. The material had been accumulating for the past three years, from various points along the Erie and piled up at the road's reclamation yards here. It is reported that the purchasers obtained the material at prices considered low. Local officials of the road decline to divulge any detailed information regarding the large sale, but admit that some of the material is already being moved on orders from the purchasers.

There is no change in the price schedules from a week ago, but dealers are looking for a general stiffening in quotations. Aside from the large tonnage sold by the Erie, the local yards are confining all business on prevailing schedules to limited lots and nearby deliveries.

Asks Bars For Export

New York, Dec. 1.—Japan has put out a new inquiry for 1,000 tons of 3-inch rounds which is believed to be for shrapnel. An inquiry for 1,200 tons of horseshoe bars also export business, is current. Not much new business in steel bars from buyers in this territory, is coming out. Here and there buyers show more willingness to consider making contracts but makers are not encouraging such action at present prices. Specifications show some tendency to increase. Prices appear firm at 1.26c, New York, or 1.10c, Pittsburgh. Recent sales of several carloads of bar iron closed on the basis of 1.07c, eastern Pennsylvania mill, or 1.17c, New York, are noted.

Furnace Coke

Is More Active—Pittsburgh Inquiries Involve Large Tonnage

Pittsburgh, Dec. 1.—Heavy buying of pig iron throughout the country has created a rather heavy demand for Connellsville blast furnace coke, inquiries for which involve about 80,000 tons a month for delivery over periods ranging from 90 days to two years. A Buffalo interest is understood to have bought 12,000 tons a month for shipment over the next two years on a sliding scale contract, and a valley consumer is reported to have closed for 10,000 tons a month for extended delivery. An eastern blast furnace interest has taken approximately 5,000 tons a month for shipment through the first quarter, at what is reported to be $1.75, ovens. Eight or nine consumers, scattered throughout the eastern, Buffalo and central western districts are actively figuring in the market. Inasmuch as contracts are being written, for the most part, on sliding scale arrangements, no

(*For complete prices see page* 1060)

definite insight into the market is possible. The *Connellsville Courier*, for the week ending Nov. 8, says production was 200,804 tons, a decrease of 5,510 tons compared with the week before.

Coke Stationary

Cincinnati, Dec. 1.—No developments have come forth in the coke market and dealers report the situation very quiet. No furnaces in this territory are in the market for coke and fully 90 per cent of the foundries have closed for requirements until after the first of the year. Prices are unchanged on all grades of southern coke.

Smelter Coke

St. Louis, Nov. 30.—A local company is in the market with a bona fide inquiry for 15,000 tons of smelter coke for delivery over the whole of next year. This, with the better feeling that prevails in the pig iron market, has encouraged sales agents in the belief that better times are near.

Steel Bars

Show Some Improvement, But Demand Not Very Active

Cleveland, Dec. 1.—Increased activity in the finished material market in the Cleveland district noted last week is being maintained, and while low prices are being made for prompt delivery on shapes, plates and bars, consumers are not able to contract for future delivery as they would like to do. There is some contracting on plates for the first quarter at 1.05c, but apparently the best that can be done on bars and shapes through the first quarter is 1.10c, Pittsburgh. The leading interest is standing firmly for 1.10c on shapes, plates and bars.

Take More Steel Bars

Chicago, Dec. 1.—Improved sentiment in finished steel products is being reflected in a slightly better condition in the steel bar market and specifications and new orders are being received in a sufficiently improved volume to give color to the better feeling. A number of sellers of finished steel have found the past week the best that has been experienced for several months. This refers to tonnage and not to prices, the latter remaining at the level quoted for some time. Agricultural implement makers are taking somewhat larger tonnage, although not as much as would be expected at this season and the demand from other sources is also much better than has been the case. Quotations remain at 1.25c to 1.34c, Chicago, the minimum being for local delivery.

Iron Bars No Stronger

Chicago, Dec. 1.—That some sellers of iron bars have been shading the prevailing quotation of 0.95c is becoming more evident. While operations of bar mills have been about the same recently as has been the rule for several weeks, business has not been sufficiently strong to maintain quotations and some tonnage has been taken at 50 cents per ton less than the ruling price. The leading producer of iron bars in this territory continues to operate practically full on current orders, but other mills are busy only a portion of the time and lose from half to full time from week to week.

Prices Irregular

Pittsburgh, Dec. 1.—Except for improvement in sentiment, manufacturers of plates, shapes and steel bars have not found any tangible evidence of a change in the situation. Demand continues light, and prices of all three products show irregularity. Plates easily are quotable at 1.05c, and it is not improbable that mills would offer that figure to obtain attractive shape or bar tonnages. In fact, material has sold at 1.05c for delivery to consumers in adjacent territory. Fundamentally, the market is considered fairly satisfactory, but there are no inquiries of importance before the trade, and mill operations are decidedly light. Mill managers believe, however, rock bottom has been touched, and a gradual resumption of activity, with a stiffening of prices, is expected.

Improvement at Buffalo

Buffalo, Dec. 1.—An improvement in specifications and in inquiries is noticed in the Buffalo district for bars and bar material. The mills and agencies report better tone to the market but more noticeable in bars and bar material than in the other finished material lines.

The general impression prevails that a more marked improvement will be noted with the passing of the present year. Prices are being held at 1.10c, base, for favorable tonnages and deliveries and 1.15c, base, on less carload lots.

Caution Prevails

New York, Dec. 1.—More caution is being shown by brokers and dealers in taking on orders for old material of much size at ruling quotations. This is due both to less inclination on the part of holders to sell and to the limited amount of material in sight, because of lighter production. Some scrap sellers state they are not willing today to accept $9.50, delivered eastern Pennsylvania, for ordinary heavy steel, though several of the important buyers now are offering this price. Occasional small lots of heavy steel are being picked up in this market to apply to old contracts and one purchase at $7.70, New York, is noted. There is a considerable demand for high grade material, especially by works which are manufacturing war supplies for Europe. One eastern Pennsylvania buyer of this class is offering $15, delivered, for low phosphorus punchings.

More Inquiry at Philadelphia.

Philadelphia, Nov. 30.—In a small way, there is more action in the steel bar market in this district, though specifications remain slow. Some moderate inquiries for shrapnel bars for France are current and a sale of about 200 tons of cold-rolled shafting for Australia has been closed. About 2,000 tons of small angles are represented by inquiries which an eastern steel maker now has in the market for estimating purposes. About 550 tons of reinforcing bars are asked from Baltimore. Practically no contracting is being done. For current delivery the market remains 1.25c, Philadelphia, or 1.10c, Pittsburgh.

Hoops and Bands Quiet

Pittsburgh, Dec. 1.—From a sentimental standpoint, the market for hoops and bands at this center shows improvement, although there has been no actual change in the situation. Specifications against contracts continue light, and no inquiries of importance are under consideration. Bands are listed at 1.10c, and hoops at 1.25c. Cold rolled shafting named at a range from 66 to 67 off, is quiet.

Tin Plate Price

For Next Season's Shipment Will Soon Be Announced

Pittsburgh, Dec. 1.—It is not improbable that some tin plate makers will open books this week for next season's shipment. While no formal announcement has been made, yet it is understood some manufacturers have indicated a willingness to sell for future delivery at about $3.25 or $3.30, but no tonnage of importance has been sold, so far as can be ascertained. A number of attractive tonnages have been sold for export shipment; the material involved probably will reach belligerent nations eventually, although shipments are being made to countries not engaged in the war. The market for prompt delivery continues weak and irregular, but there has not been enough selling at any price to offer much insight.

(*For complete prices see page* 1060)

Cast Pipe

Bids Taken by Santos, Brazil—Detroit Letting Deferred

New York, Dec. 1.—Santos, Brazil, which has been mentioned several times as a prospective buyer of pipe in this country, took bids from American foundries last week on 6,000 tons of 28-inch. It is believed that this business will come to this country. An inquiry for 1,000 tons of 4 to 10's for Arroyo, Porto Rico, is current. Winnipeg has placed 360 tons of 12 and 14's with the Canadian Iron Corporation and the Havana Gas & Electric Co. has bought 250 tons from a southern shop. A better volume of domestic business continues to be booked. Private buyers, including gas and water companies, are more active and are buying and negotiating more heavily for their forward requirements. A Jersey water company placed 1,800 tons of 6 to 16's with the United States Cast Iron Pipe & Foundry Co. This same maker has taken 1,500 tons of 4 to 30's for Lynn, Mass., and 3,900 tons of 60's for Boston, the latter at a price of $19.60, delivered. It is believed that a large part of the 25,000 tons of 6 to 48-inch pipe for Detroit, bids for which went in last week, will go to the local plant of The American Car & Foundry Co., which is a maker of pipe. Action on these bids has not yet been taken. Sweetwater, Tex., takes bids Dec. 5 on 2,500 tons of 4 to 12's. Plainfield, N. J., asks 150 tons of 6 and 24's for Dec. 8. Prices show no improvement. For 6-inch, $18.50 to $19, at eastern Pennsylvania foundries, or $20 to $20.50, New York, is being done and about $18, foundry, for the larger sizes.

Big Letting Deferred

Chicago, Dec. 1.—Award of one of the largest tonnages of the year at Detroit, involving 25,400 tons, has been deferred until Dec. 8, when the proper official board will announce its decision. It is said about two of the low bids for this business will represent a loss to the makers of approximately $2 per ton, although conditions may warrant the bids and allow the makers to come out whole. The United States Cast Iron Pipe & Foundry Co. has been awarded 600 tons of 36-inch sewer pipe at Sandusky, O. Bids will be opened Dec. 3 for 5,000 tons at Dayton.

Oil Country Goods Decline

Pittsburgh, Dec. 1.—The National Tube Co., under this date, has reduced the price of oil country material, including tubing, casing, drive and 2-inch line pipe 5 per cent, or about $1 a ton, to make prices more nearly conform with those of standard steel pipe, quotations on which were lowered $1 a ton Nov. 2. The last previous change in the price of oil country goods was May 1. Boiler tubes and iron pipe have not been affected. Demand for tubular goods continues light, but discounts are described as steady.

Billet Exporting

Is Interfered With by High Freight Rates

Philadelphia, Nov. 30.—Inability to obtain reasonable freight rates is the cause attributed by merchants and sellers in this district for their failure to obtain more of the export orders in semi-finished steel, upon which they recently have quoted. Eastern makers state they have gone so low in their mill prices to attract this business, that they have crossed the cost line, without much result and are more indifferent to the additional inquiries that are being laid before them. Middle western makers seem to have fixed upon $18, mill, for billets and sheet bars, equivalent to $19.45 to $19.85, Baltimore, as the absolute minimum of their export endeavors. Inquiries for export still appear but they are attracting less attention. The domestic market on billets is very dull, the slowest in a long time according to eastern producers. Eastern mills hold rolling billets at $21.40, Philadelphia, or $19, Pittsburgh. Middle western mills, however, have shaded the latter Pittsburgh equivalent on some recent eastern business, as previously reported.

Quiet at Pittsburgh

Pittsburgh, Dec. 1.—The market for semi-finished steel products is quiet. Consumers have displayed a greater interest in the situation, but there has been no activity of consequence. Billets are quotable at $19 and sheet bars at $19.50, for prompt delivery. Makers have made no suggestions as to what prices they will ask for delivery after Jan. 1. Wire rods show no change in position, although expressions are heard that $25, Pittsburgh, now represents the top of the market.

Adding to Force.—The J. I. Case Threshing Machine Co., Racine, Wis., has added 200 workmen to the force in the new South works and expects to be able to continue the increase at this rate for the month of December. About 1,000 workmen of the total of 2,700 were laid off or placed on reduced schedules several months ago.

(*For complete prices see page* 1060)

Ore Movement

For the Season Smallest Since 1908—One December Cargo

Iron ore shipments during November were 1,068,682 gross tons, making the season's shipments to Dec. 1, 32,020,487 tons. A small cargo was shipped from Escanaba on Dec. 1 that is not included in these figures as the report of the exact amount of the cargo has not as yet been received from the shipping dock. The 1914 movement is the smallest since 1908 when the mines sent forward 25,427,094 tons, but it is only a few thousand tons behind the movement of 1911, when shipments were 32,130,411 tons. It shows a loss, however, of 17,049,991 tons from the movement of 1913, when 49,070,478 tons were moved. This is a reduction of practically one-third and shows very clearly what the vessel owners have been up against all season. The single cargo sent forward on Dec. 1 after insurance expired was moved at summer rates, when ordinarily $1 would have been paid for that service. Not from start to finish did lake trade during 1914 exhibit any sign of life.

Small Lots Taken

New York, Dec. 1.—Some small lots of eastern domestic ores recently have been taken by eastern Pennsylvania makers, but there is no interest shown by buyers to make more extended contracts, despite attractive offers by sellers. Larger eastern mining properties have been shipping at the rate of 50 to 60 per cent of last year's tonnage.

Wire Active But Irregular

Pittsburgh, Dec. 1.—Despite comparatively satisfactory conditions enjoyed by manufacturers of wire products, prices continue weak and irregular. Some makers have abandoned hopes of obtaining $1.60 a keg for nails, and plain wire is selling at $1.35. Domestic demand has reflected no improvement. Belligerent nations continue to figure in the market for barbed wire, and wire departments are well supplied with orders.

Attorneys for a Pittsburgh tax payer who sought to prevent the carrying out of a contract for the new Schenley high school, on the ground that it was not awarded the lowest bidder, will take the case to the supreme court. The board of education awarded the contract to the James L. Stuart Co. The structure will require about 1,300 tons of steel, which will be furnished by the Riter-Conley Mfg. Co.

Inquiries for Steel

To Rebuild Bridges in European Countries Are Being Received—Better Bookings by Some Mills

New York, Dec. 1.—Considerable interest has been aroused in certain quarters of the structural market by the appearance of preliminary inquiries for bridges and other steel work for reconstruction purposes in certain of the European countries at war. Both France and Russia have been bringing this matter to the attention of the bridge shops and in some cases have put out definite inquiry for prices. At the present time, however, it is believed that these negotiations are only preliminary to more extensive inquiries to come forward at later dates, when more settled conditions in Europe will permit serious consideration of these reconstruction requirements. It has been suggested that American bridge engineers be sent abroad, particularly to France, to look over the ground preparatory to later developments. While obviously no reliable estimates of the requirements can be made at this time, wherever any figures have been mentioned, they have run to large proportions. Other smaller inquiries for fabricated work and plain material have been coming out from Brazil, Japan, and elsewhere. A recent inquiry for 1,700 tons of angles for Japan is understood to have been satisfied in this country. More activity in small work and a better feeling continue to be shown in the structural market in this territory. Some of the mills report better bookings from this district. Railroad orders still are scant. Plain material prices manifest a slightly firmer appearance, and 1.26c, New York, or 1.10c, Pittsburgh, appears to be more uniform.

Some Improvement in East.

Philadelphia, Nov. 30.—A slight betterment in actual orders and more defined prospects for a larger volume of business to be placed later, are supplanting recent pessimism among eastern shape mills, with a more pronounced cheerfulness. Though total bookings still are drooping and new business is not balancing shipments, it is believed that a turn in the right direction has been made. Buyers show more activity in putting their plans in shape for figures. Coal companies in the Scranton-Wilkesbarre district are inquiring for numerous small requirements and have larger plans in early view. The Lehigh & Wilkesbarre Coal Co. soon will come out for a large repair shop at Wilkesbarre. A breaker at Wanamie, Pa., 600 tons is about to be figured. The government soon will issue a call for bids on 6,000 to 8,000 tons of pier construction at Pearl Harbor, Hawaii. The usual price on shapes in this territory remains 1.25c, Philadelphia, or 1.10c, Pittsburgh, and recent shading of this level is not so manifest.

Several Tonnages Placed

Pittsburgh, Dec. 1.—Several attractive tonnages for structural material have been placed this week. The McClintic-Marshall Co. has taken three contracts involving 1,225 tons, and the Riter-Conley Mfg. Co., as indicated a week ago, will furnish 1,300 tons for the new Schenley high school at this city. Fabricating shops are in need of additional tonnages, however, and prices continue low and irregular.

Lively Competition.

Cleveland, Dec. 1.—Keen competition characterizes the structural market. During the past few days, erectors who figured on a basis of 1.10c, Pittsburgh, for the plain material have lost to others who apparently are bidding on a basis of at least $1 per ton lower. The contract for erecting the steel for the Lindner building, 1,300 tons, has been awarded to T. H. Brooks & Co., who have not yet placed the order for the steel. The pier sheds at the foot of Ninth street, 500 tons, will be erected by the McClintic-Marshall Co. The plans for the Willys-Overland building at Toledo are not yet ready.

Continue Dull

Chicago, Dec. 1.—While the improvement in general sentiment has extended to structural shapes, it has not yet been registered in large structural contracts being let in the west and the week just past finds a tonnage of less than 1,000 tons finally awarded. Prices range about the same as has been the case through the fall with 1.25c to 1.34c, Chicago, practically nominal.

Detroit's Building Plans

Detroit, Dec. 2.—City building operations will be carried on at a rapid rate in Detroit during the present winter, if the plans of city officials hold good. It is proposed to construct a new municipal court building, as well as other city institutions and thus give as much work as possible to men who are now out of employment. Arrangements are now being made with a number of contractors and it is believed something in the way of a definite announcement as to when work will be started will be made within the next week or two.

(*For complete prices see page* 1060)

CONTRACTS PLACED.

Shop for Lehigh & New England railroad at Penn Argyl, Pa., general contract awarded Lathrop, Shea & Henwood, Scranton, and revised figures asked on steel.

Additional construction for Southern Power Co., Charlotte, N. C., 300 tons, divided between the Belmont Iron Works and the Virginia Bridge & Iron Works.

Addition to plant of Lackawanna Cold Storage Co., Scranton, Pa., 150 tons, awarded Guerber Engineering Co.

Lindner building, Cleveland, 1,300 tons, steel contract awarded to T. H. Brooks & Co., by the Crowell-Lundoff-Little Co., general contractor.

Lake Shore subway bridge, Elyria, 450 tons to the King Bridge Co.

Orlando Hotel, Decatur, Ill., 700 tons to Decatur Bridge Co.

John R. Hanify, one-story theater building, San Francisco, Cal., 120 tons, to Dyer Bros.

Extensions to the plant of the Remington Arms-Union Metallic Cartridge Co., Ilion, N. Y., 2,000 tons, awarded the Lackawanna Bridge Co.

Extensions to various plants of the Dupont Powder Co. estimated to exceed 2,000 tons, of which about 600 tons were awarded to the American Bridge Co. and the balance to independent shops.

Milliken warehouse, 1117 Beech street, New York City, 800 to 900 tons, awarded Hay Foundry & Iron Works.

Bridge work for Cincinnati, Hamilton & Dayton railroad, 150 tons, awarded Mount Vernon Bridge Works.

Bridge material for Ligonier Valley railroad, 225 tons, awarded to McClintic-Marshall Co.

Hudson Motor Car Co., plant addition 500 tons awarded to McClintic-Marshall Co.

Pier sheds for the D. & C. Line at Cleveland, 500 tons, awarded to McClintic-Marshall Co.

Building for Clarksburg Glass Co., Clarksburgh, W. Va., 600 tons, awarded to Moss Iron Works, Wheeling.

Iola Sanitorium, addition, Rochester, N. Y., 250 tons, to R. T. Ford Co., Rochester, general contract.

CONTRACTS PENDING.

Pier construction for United States government at Pearl Harbor, Hawaii, 6,000 to 8,000 tons, plans being prepared.

Repair shops for Wilkesbarre-Lehigh Coal Co., Wilkesbarre, Pa., tonnage indefinite, plans being prepared.

Coal breaker at Wanamie, Pa., 600 tons, about to be figured.

Bonds for a steel bridge at Parkersburg, W. Va., which will involve 3,500 tons of steel, have been purchased by Harris, Forbes & Co., New York. Henry Laub, engineer, Pittsburgh, has the contract.

Power house for the Victor Talking Machine Co., Camden, N. J., 700 tons, bids being taken.

Fuel oil storage tanks at various locations for the United States government, 1,000 tons, bids being taken.

Cotton warehouses at New Orleans, now learned to be largely of concrete construction and little steel to be required.

Dull Month

Was November in Railroad Buying—Few Cars Pending

New York, Dec. 1.—November proved to be another exceedingly small month in railroad buying, although it was a little better than in October. In rails, cars and locomotives, a slightly larger volume of orders was placed, but the totals in these three lines still were so light as to arouse little satisfaction among manufacturers.

Confirmed rail sales reported in November aggregated about 50,000 tons, compared with 30,000 tons in October, 40,000 tons in September and 70,000 tons in August. The November orders bring the total reported awards of rails this year to date to 1,130,000. The largest order in November was 25,000 tons for the New York Central & Hudson River railroad. The Atchison, Topeka & Santa Fe railroad closed late last week for 13,000 tons of rails with the Illinois Steel Co. The Lehigh Valley railroad is understood to have placed a partial order for 2,000 to 3,000 tons with the Bethlehem Steel Co.

The Northern Pacific railroad just has placed 92 steel passenger cars of various types with the Pullman Co., which, with 21 sleeping cars previously awarded, makes its total order 113 cars. The Santa Fe has given the Pressed Steel Car Co. 100 tank cars. These orders of the past few days bring the total car awards in November to about 525 against less than 50 in October. The Union Tank line is in the market for 500 tank cars. There is talk that the Clover Leaf will buy box cars when it can make proper financial arrangements, but no inquiry has been issued. Locomotive orders in November were better, principally as the result of the buying for export by Russia, France and other countries, but conditions in that market still are slow.

There have been no further developments in the inquiries for rails for Norway and Russia and for cars for Russia, Chile and other countries.

War Orders

Cause Increased Activity of Canadian Plants

Toronto, Nov. 30.—There is a decided increase of activity in the steel and iron industry, largely on account of orders received from Britain for war supplies. President J. H. Plummer, of the Dominion Steel Corporation, states that it is busy shipping wire, wire nails and rods to England, having more orders for barbed wire than can be filled. Machine bolts, rivets, carriage bolts and billets are also in demand. As one result of the war, the company is making the line of special oval wire nails, formerly supplied by Germany. The rail mill is running on an order from New South Wales.

The Steel Co. of Canada, which has started up its largest blast furnace at Hamilton, reports orders coming in freely for bolts, rivets and the class of articles required by the manufacturers of agricultural implements and wagons.

The Russell Motor Car Co., of Toronto, has received from the Canadian government an order for 40 armored motor cars. Each car will carry a gun mounted in a revolving turret protected by steel armor capable of withstanding rifle fire at a distance of 100 yards, inside of which there will be space for five men.

C. A. Lacroix, formerly manager of the Reith Bank of Paris, and now purchasing agent for the French government, has opened an office in Montreal and will probably place some extensive orders in Canada. He is negotiating with the Ross Rifle Co.

Will Confer

With Colorado Operators as to Work of Commission

Washington, Dec. 1.—President Wilson is apparently confident that success will greet the efforts of the commission he has named to settle the Colorado coal strike. The commission, made up of Seth Low, New York, chairman; Patrick Gilady, Clearfield, Pa., and Charles W. Mills, Philadelphia, are arranging to meet at once with the Colorado operators. Conference with the latter will be held by representatives of the Department of Labor, now in Colorado, for planning the work of the commission. Federal troops will be maintained in Colorado until the commission has submitted its report.

The belief has been expressed that the President will suggest a similar commission be created by Congress to act in like controversies. The federal mediation commission's success in settling railroad disputes without strike has, it is thought, convinced the President that a body of that kind should be in existence to act in other industries, or that the jurisdiction of the present mediation board should be extended to include all industries engaged in interstate commerce.

Mr. Mills is a member of the firm of Swayne & Mills, Philadelphia, is the chief owner of the Climax Coal Co., and is credited with having had considerable experience in dealing with strike troubles. He was one of the two conciliators of the Westinghouse strike at Pittsburgh last spring.

Personals

Wilfred Sykes will read a paper on "Electrically Driven Reversing Mills" before the Association of Iron and Steel Electrical Engineers, Dec. 5, at the Seventh Avenue hotel, Pittsburgh. The address will follow a dinner.

C. E. McQuigg, assistant professor of metallurgy at Pennsylvania State College, gave an illustrated talk on "The Iron and Steel Industry", last week, at Johnstown. He was introduced by D. M. Stackhouse, assistant superintendent of the Cambria Steel Co.

G. P. Blackiston, advertising manager of the Berger Mfg. Co., and the Stark Rolling Mill Co., Canton, O., during the past five and one-half years, tendered his resignation Dec. 1. Mr. Blackiston now will devote his entire time to the Advertising Laboratories, Canton, which was not possible with his former connection. His successor has not yet been appointed, but temporarily R. K. Krichbaum will have charge of the advertising of these two companies.

W. H. Phillips, metallurgist, R. D. Nuttal Co., Pittsburgh, will read a paper on "Recent Developments in the Heat Treatment of Gearing", Dec. 1, before the Engineers' Society of Western Pennsylvania. "Possibilities in Technical Photography" is the subject of a paper to be offered Dec. 15 by Frederick Henius. "Emergency Dams of the Panama Canal" will be discussed before the structural section of the society at an early date by O. E. Hovey, assistant chief engineer, American Bridge Co. At the annual meeting of the organization, E. E. Haslam, engineer, state water supply commission, will give an address on "The Pymatuning Reservoir Project".

F. D. Egan, electrical engineer for the Pittsburgh Crucible Steel Co., Midland, Pa., has been appointed steam and hydraulic engineer for the company, but will still continue as electrical engineer. Mr. Egan has been connected with the company as electrical engineer for the past three years, and in designing the electrical equipment for the plant, has incorporated a number of radical changes from past steel works' practices —notably that of underground transmission; alternating and direct current; and all lighting circuits. Mr. Egan read a paper on this subject at the recent convention of the Association of Iron and Steel Electrical Engineers held at Cleveland. Mr. Egan is a member of the American Iron and Steel Institute, as well as the American Institute of Electrical Engineers, and the Association of Iron and Steel Electrical Engineers.

M. A. Hanna & Co. Sell Hill Ore

Will be Agents for the Great Northern Properties—Biggest Stripping Contract Ever Awarded on the Mesabi is Let for Hill Annex

St. Paul, Dec. 1.—A very important contract has just been made by the trustees of the Great Northern Iron Ore properties with M. A. Hanna & Co., by which the Cleveland firm becomes the selling agent for all of the ore of the Great Northern or Hill mines. That it will be the policy rapidly to develop these mines is shown by the fact that a contract has been let to strip 8,500,000 cubic yards from what is known as the Hill Annex, a property which has been explored, but has not yet become a shipper. This is the biggest stripping contract ever let on the Mesabi range.

The contract with M. A. Hanna & Co. means that that firm will have the selling of fully 400,000,000 tons of ore, as the official estimate of the ore contents of the Hill properties Jan. 1, 1914, was 411,449,154 tons. Some unofficial estimates of the tonnages of the different properties have exceeded this official statement.

During the term of its lease, the United States Steel Corporation has expended about $6,000,000 in development work. The trustees of the Great Northern Ore Properties, in their seventh annual report, that for the year ending Dec. 31, 1913, show the steps being taken by the Arthur Iron Mining Co., a subsidiary, to develop the lands formerly covered by the Hill ore lease, but surrendered by the Steel Corporation. This report says:

"In 1912, $300,361 was spent for mine development, while last year this expense totaled $1,057,360. Three large mines are being stripped, one of which, the Smith, is ready for shipping. It contains 600,000 tons of ore. The Dean-Itasca mine, formerly called the Whiteside, which contains 5,500,000 tons of ore, can ship ore this year. At the Dunwoody mine, 8,000,000 tons of ore will be ready for working by July 1, 1915, and a portion of the ore body will be exposed by August 1, of this year."

Under the terms of the lease of the Steel Corporation, which expires Jan. 1, 1915, the minimum tonnages to be mined were as follows:

	Gross Tons.
1907	750,000
1908	1,500,000
1909	2,250,000
1910	3,000,000
1911	3,750,000
1912	4,500,000
1913	5,250,000
1914	6,000,000

Up to Jan. 1, 1914, there had been shipped 440,463 tons less than the tonnage required as the minimum. As the minimum requirement for 1914 is 6,000,000 tons, the tonnage to be shipped this year to satisfy the terms of the lease is 6,440,463. Exact figures as to shipments this year are not yet available, but undoubtedly the minimum shipment has been made.

The shipments from the Hill lands in 1907 were 137,270 tons; in 1908, 508 tons; in 1909, 41,624 tons; in 1910, 2,152,977 tons; in 1911, 5,499,759 tons, while in 1912 they were 7,490,509 tons and in 1913 they declined to 5,236,890 tons.

Ore Shipped From Hill Mines

Year.	Tons shipped.	Iron content.	Average royalty.
1907.....	137,270	58.7641	$0.838726
1908.....	508	65.1498	1.180295
1909.....	41,624	56.4001	.792687
1910.....	2,046,970	56.9633	.853830
1910.....	106 007	—49.00	.30
1911.....	5,344,078	58.2148	.945308
1911.....	155,681	—49.00	.30
1912.....	7,435,051	58.3212	1.186650
1912.....	55,458	—49.00	.50
1913.....	5,221 987	59.6211	1.283936
1913.....	14,903	—49.00	.50
	20,227,488	58.4905	$1.111151
	332,049	—49.00	.342380

Principal Shippers

The principal shippers from the Hill lands for the last three years are as follows:

	1913. Gross tons.	1912. Gross tons.	1911. Gross tons.
Dale	621,415	1.106,808	1,002,292
Harold ..	92,054	187,926	281,293
Hill	855,965	1,188,908	1,550 568
Leonard .	1,253,367	2,198,119	1 293,463
Mace	140,953	136,524	124,721
Mississippi	122,972	274 729	328,601
Uno North	381,632	545,033	479,315
Uno South	1,202,341	1,305,216	266.390
	4,670,699	6,943,263	5,326,643

Estimated Ore Contents of Great Northern Iron Ore Properties

The annual report of the trustees of the properties for 1912 showed the tonnages estimated by the Great Western Mining Co., as of the first day of January of that year, in the lands leased to it in 1907; the figures for the so-called old mines being those of the State Tax Commission as of May 1, 1912. Taking these as a basis and deducting shipments of the years 1912 and 1913, the following ore remained on the first day of January, 1914:

In lands formerly under lease to the Great Western Mining Co., a portion of which that company still retains, the release of same taking effect Jan. 1, 1914:

	Tons.
Lands owned in fee	105,624,071
Leaseholds of the first class	105,341,673
Leaseholds of the second class	103,119,045
	314,084,789
In mines covered by the old leases	97,364,365
Total	411,449,154

An indeterminate portion of the 314,084,789 tons above is washable ore, viz.: Ore associated with free silica, which is susceptible to concentration by washing process. In the reduction of the crude material to concentrates the bulk is reduced from 40 to 50 per cent.

Sharp Fall in Pig Iron Output

November Production Was Smallest of Any Month in Six Years—Net Loss of Eleven in Active Furnaces

Pig iron production in November was the lowest of any month since the decline in blast furnace operations set in early in 1913. Output last month was 1,512,972 tons compared with 1,767,227 tons in October, a loss of 254,255 tons. The total for November was the smallest in 74 months, or since September, 1908.

The number of active furnaces showed a net loss of 12, making the total active on the last day of November 150, the fewest stacks blowing since May, 1908. Three stacks were blown in last month, one merchant and two steel furnaces. Fifteen were put out of blast, including 12 steel works furnaces and three merchant stacks.

The average daily production in November was 50,432 tons, compared with 57,007 tons in October, a loss of 6,575 tons. Declining activity of steel works furnaces again proved to be the principal factor in the decline. Production of non-merchant furnaces in November was 1,057,317 tons, compared with 1,292,751 tons in October, a loss of 235,434 tons. In average daily output, these furnaces averaged 35,244 tons last month against 41,702 tons in October, a loss of 6,458 tons.

Production of merchant iron in November was 433,499 tons, compared with 455,068 tons in October, a loss of 21,569 tons. Average daily production in November was 14,450 tons, against 14,680 tons in October, a loss of 230 tons.

The production of ferro in November was 11,863 tons against 13,593 tons in October, a loss of 1,730 tons. Spiegel production last month was 10,293 tons, compared with 5,815 tons in October, a gain of 4,478 tons.

Several merchant furnaces are reported to be scheduled for relighting early this month, due to the increase in sales of pig iron and this fact is believed to insure November being the low month in the decline. Cherry Valley furnace was relighted Dec. 1.

Stacks blown in last month were: One Lorain, National Tube Co.; one Bethlehem, Bethlehem Steel Co., and one Lock Ridge, Thomas Iron Co.

Furnaces blown out were: One Madeline, Inland Steel Co.; two Gary, Indiana Steel Co.; one Central and one Schoenberger, American Steel & Wire Co.; one Ohio, one Carrie and two Duquesne, Carnegie Steel Co.; one Youngstown, Youngstown Sheet & Tube Co.; one Swede, Alan Wood Iron & Steel Co.; two of the Sloss-Sheffield Steel & Iron Co.; one Iroquois, Iroquois Iron Co. and one Ensley, Tennessee Coal, Iron & Railroad Co.

MONTHLY PRODUCTION.

	1914.	1913.	1912.
January	1,879,336	2,787,800	2,052,806
February	1,888,607	2,578,670	2,098,796
March	2,341,551	2,762,823	2,411,529
April	2,261,501	2,754,353	2,377,621
May	2,097,019	2,816,825	2,503,341
June	1,904,566	2,616,883	2,433,737
Total 1st half	12,372,580	16,317,354	13,877,830
July	1,955,324	2,558,275	2,402,567
August	1,996,483	2,537,018	2,500,163
September	1,882,718	2,494,098	2,444,454
October	1,767,227	2,539,924	2,683,645
November	1,512,972	2,229,960	2,639,562
December	.....	1,976,138	2,777,292
Total 2d half.	.....	14,335,413	15,447,683
Grand total.	21,487,304	30,652,767	29,325,513

AVERAGE DAILY PRODUCTION.

	1914.	1913.	1912.
January	60,624	89,929	66,220
February	67,450	92,095	72,372
March	75,534	89,123	77,791
April	75,383	91,812	79,254
May	67,646	90,865	80,753
June	63,486	87,229	81,125
July	63,075	82,525	77,502
August	64,403	81,839	80,650
September	62,757	83,137	81,482
October	57,007	81,933	86,569
November	50,432	74,322	87,985
December	.....	63,746	89,590

NOVEMBER PIG IRON.

States.	No. of stacks.	No. in blast last day of month. Nov.	Oct.	Total tonnage made. Merchant.	Non-Merchant.	—Totals— Nov.	Oct.
Pennsylvania	157	64	67	107,004	547,184	654,188	733,434
Ohio	73	29	31	78 764	260,704	339,468	408,495
Alabama	45	16	19	100,493	45,517	146,010	155,887
Virginia	22	4	4	12,929	.....	12,929	13,331
New York	26	11	11	56,868	50,446	107,314	113.599
New Jersey	6	1	1	6,910	.....	6 910	6,860
Illinois	26	8	9	21,328	67,701	89,029	120,801
Colorado	6	2	2				
Indiana	10	3	6				
Maryland	4	1	1				
Wisconsin	6	2	2	13,908	78 862	92,770	153,616
Kentucky	7	2	2				
West Virginia	4	1	1				
Tennessee	18	5	5				
Washington	1	0	0	26,805	6,903	33,708	32,270
Georgia	2	0	0				
Texas	3	0	0				
Minnesota	1	0	0				
Michigan	3	1	1				
Missouri	1	0	0	8,490	.....	8.490	9,526
Spiegel—All states...						10,293	5,815
Ferro—All states....						11,863	13.593
Totals	421	150	162	433,499	1,057,317	1,512,972	1,767,227

Higher Prices

On Pig Iron Are Expected in the Pittsburgh District

Pittsburgh, Dec. 2. (By wire.)—Pig iron selling continues to feature the market in this district and indications are that dealers will advance prices 25 cents a ton before the end of the week. Leading foundry iron sellers now are asking $13, valley, for both foundry and malleable and some blast furnace managers are refusing to sell steel-making grades at prevailing quotations. A radiator interest has closed for 3,000 tons of No. 2 foundry and a car builder has taken 1,000 tons of the same grade for first quarter delivery. Tonnages involved will be shipped by a nearby stack. Two 5,000-ton lots of basic have been sold this week at a price equivalent to $12.50, valley, and a sale of 500 tons of Bessemer at $13.75, valley, is noted. A gray forge melter in western Pennsylvania has taken 3,500 tons of first quarter iron at a price equivalent to $12.50, valley, and a prominent dealer reports a sale of two 2,000-ton lots of foundry at a price equal to $12.75, valley.

Buys Southern

St. Louis, Dec. 2. (By wire.)—The American Stove Co. has bought 1,000 tons of southern No. 2.

Asks for Receiver.—An action for praying a receivership and accounting was filed at New York, Nov. 18, against the United States Motor Co., a New Jersey corporation, by Emanuel Metzger, a stockholder. The complainant charges that the affairs of the company are being mismanaged, and that the assets of the company have been wasted. President Benjamin Briscoe and the other directors, are made defendants in the action. The United States Motor Co. has a capitalization of $42,500,000.

FIGHT CORRUPT BUSINESS PRACTICES

Said President Hartness, But Do Not Antagonize Companies Because They Are Big

Strong Plea for Large Things and for Ample Appreciation of Services in Other Ways Than in Paying Dollars---Annual Convention of the American Society of Mechanical Engineers---Dr. John A. Brashear the New President

Devoting his remarks to the significance of the human element in economic problems, the speech of President James Hartness in opening the annual convention of the American Society of Mechanical Engineers, at the Engineering Societies building, New York, on Tuesday evening, Dec. 1, ranked with the most scholarly and interesting to which the society has listened in many years. Beginning with a study of the human individual and his characteristics, Mr. Hartness enumerated the methods that must be pursued in order to attain the best results. The scope of his remarks embraced a remarkable analysis of the so-called "trust problem" in this country; he declared that natural and immutable laws have decreed the existence of large industrial organizations, to the exclusion of the smaller units, and that instead of endeavoring to break up large organizations, "reformers" should devote their efforts to making such organizations adhere to a certain ideal.

The reform movement against trusts, said Mr. Hartness, has accomplished some good results, but it also has been very injurious to the industrial life of this country, for this good work has been done by men who have not known the supreme value of industrial coordination of effort, established at great expense of energy and after years of labor on the part of workers and executives. This synchronous action of many workers is what constitutes the life blood of the industries and represents the highest type of co-operation. Despite its great power for effective effort, it is something that may be destroyed by a word. Its destruction, he said, is not the destruction of something having material value only; it is a vital thing. It is something that can neither be weighed on the scales nor measured with a yard stick. To certain types of investigators it is not known, and yet it may be destroyed or weakened by a disorganizer without his intention or knowledge. He may feel that nothing has been destroyed as long as the buildings and machinery still are in good condition.

Destruction and Suffering

Destroying organized work when the purpose is to correct a harmful mode of transacting its commercial or financial business, is a serious blunder that has caused suffering and great loss to the very people it was intended to benefit, and many of these people are still calling for more such work. Antagonism to the trusts, said Mr. Hartness, should be centered against corrupt practices, and not against the organization, for that involves the worker's interests. Our government, he said, should be equal to correcting irregular business practices. It wishes to benefit the people, but it seems to be lacking in that completer knowledge of industrial conditions and life that is essential to a successful coping with this important matter. It is for the engineer who knows the conditions essential to efficient organization, to point out how we may reform business methods without that injury to the public involved in the interruption of industry. If we are to be constructive, instead of destructive members of society, we will build upon what we have with due regard for the inertia of the human being. We will not disorganize and disturb the creative work in our attempt to correct the business administration. If we consider the welfare of the individual inside and outside of these organizations and let that be the measure, he said, we will cease much of this destructive campaign.

If we bear in mind that the greatest good to the greatest number can come only from plans that take into consideration each human being, it will change our attitude toward the larger units and the combinations of smaller units, and this leads to a general recognition of the fallacy of the theory that the interests of the people can be served by the destruction of the large organizations. The fact that some of these organizations have been built up by unfair methods and that much harm has been done to both the workers within the organization and to the general users of the product, should not obscure the fact that due to economic laws, there is an inevitable trend toward large units and that in these units the individual is most favorably conditioned. We must remember, too, Mr. Hartness said, that the final contest in the world will be fought by the large units and that ultimately there will be a monopoly established somewhere in each branch of industry. While we can keep monopolies out of our country, we cannot keep them off the face of the globe. If we wish to push forward our own nation in a friendly spirit of contest, he said, we must not deceive ourselves into thinking that we can win with small units against others having the larger units. Even if these questions of national supremacy be put aside, he declared, we have no justification for the stultifying misuse of human energies.

Too often, continued Mr. Hartness, the dollar is looked upon as the only real measure of recognition of value of services rendered. This general view should not obscure the fundamntal fact that it is not the dollar for the dollar's sake, even when the dollar seems to be the only stimulus, but that the most important and the most potent stimulus is one that satisfies man's longing for an appreciative recognition of the value of his services. In any ideal organization, therefore, there should be some system by which earnest efforts are recognized by someone who can in a beneficial way express an appreciation. Piece work system, Halsey premium plan, Gantt bonus method, the Taylor system, and various other dollar awards, in a measure, fill this need, but the more we study the human mind, the more we see that the real pay that each man craves is a recognition and an appreciation, and even with the dollar as a standard in the final analysis, we find that it is

sought because it bears evidence to the recognition of value of service. A manager, he said, must see to it that his men are not underpaid in the coin of appreciative esteem.

Mr. Hartness directed attention to the value of a human report which he said should receive the same degree of attention as the treasurer's report. The human report, he said, would cover the entire organization and would contain a statement regarding the elements of harmony of organization; of length of service of manager and workers; the frequency of changes of all kinds in the business; the efficiency of each man, etc. "The investor," he concluded, "who considers this human rating with the treasurer's statement, seldom will make a mistake in estimating the true worth of an industrial organization. May we not hope that tabulations of these various elements taken from a variety of industries will lead to establishing a standard that will be a guide to both the manager and the investor?

The New Officers

There was a liberal attendance Tuesday night to hear the opening address as well as to greet the newly elected officers who are to serve during the coming year. These are as follows: President, Dr. John A. Brashear; vice presidents, Henry Hess, Geo. W. Dickie and Jas. E. Sague; managers, Chas. T. Main, Dr. Spencer Miller and Max Toltz; treasurer, Wm. H. Wiley. Following the presidential address, and the introduction of the newly elected officers, Dr. Hartness and Dr. Brashear were tendered the usual reception in the Engineering Societies building.

The program of the convention provided for professional sessions on Wednesday, Thursday and Friday. A complete report of the proceedings at these sessions will appear in next week's issue of THE IRON TRADE REVIEW.

Mills Take Material

Cleveland, Dec. 2.—Better feeling of the past two weeks in the iron and steel scrap trade is becoming crystallized in higher prices and better market activity. With one exception, all of the important consuming mills of the district are taking in material, whereas a week ago there was practically no movement. Heavy melting steel now is quoted $9.25 to $9.50, as compared with $8.50 to $9 a fortnight ago. Dealers say the outlook is better today than it has been for two years. Of course, the market has a long way to go before prices again are normal, but it is felt the turn has come. Large supplies of scrap are laid down in sellers' yards, but this material will not be available until the market has advanced considerably.

Rather Mild

For Pitchfork Ben is Comment on Armor Plate Making

Washington, Dec. 1.—The government should build its own armor plate plant, in the opinion of Senator Benjamin R. Tillman. Mr. Tillman is chairman of a commission authorized by Congress, which last week inspected the armor making plants of the Carnegie Steel Co., the Bethlehem Steel Co., and the Midvale Steel Co. The others are Rear Admiral Joseph R. Strauss, chief of the bureau of ordnance, Navy Department, secretary, and Representative L. P. Padgett.

The commission expects to make its report in January, Senator Tillman said, and he expressed the belief that it will recommend the building of a plant, although he said he could not speak for the other members of the commission. If such a recommendation is made, it was stated, it is not at all likely that the present Congress will make an appropriation for the plant, but that the Sixty-fourth Congress will. The Senator said that in view of conditions brought about by the European war, and the attention being given to the submarine as a factor which might partly replace the battleship, it is well to go slow with plans for the erection of an armor plate plant. But at present he thinks there is every reason why it should be built.

It is his opinion that a plant capable of turning out annually enough armor for one battleship should be constructed. This would mean between 8,000 and 10,000 tons, and would cost, Senator Tillman thinks, $8,000,000 or $10,000,000. He thinks the government should not install the blast furnace, but instead should purchase its pig iron in the open market.

While expressing the belief that there is a combination among the armor makers, Senator Tillman blames the government for this alleged condition more than he does the manufacturers. In years past, it was said, the Midvale company would submit the lowest bid for armor, but would get only one-third of the tonnage, the remaining two-thirds being distributed equally between the other companies at the prices they had submitted, and not at the lowest bid submitted. Senator Tillman insisted this had been the practice.

The Senator said, after the original investment had been made, there would be no overhead charges, as the government pays no taxes, insurance or interest. Officers would be employed, it was stated, who have to be paid whether busy or idle. Moreover, it was contended that, even if the plant were idle most of the time, it would pay to build it as it would be a compelling force to make private manufacturers hold down their prices. Confidence was expressed that the government could make armor more cheaply than private makers can. The Senator said he would be willing to have the private makers given contracts sufficiently large to pay them to continue their plants, if the government entered the field.

Praise was sounded for the armor plate makers, whom the Senator characterized as being a high type of men. He said he knew that these manufacturers would not allow any faulty material for the government to be turned out by their plants. The Senator also said he could not blame the armor plate makers for refusing information to the commission which would give away business secrets.

METAL MARKETS

New York

Dec. 1.

The feature of interest in the metal markets during the week was the action of the leading lead producer, after having advanced its New York price until it stood at 3.90c, in unexpectedly reducing from this figure to 3.80c, New York. The reduction, which evidently was designed to discourage any increase in production on the part of competitors, naturally served to scare off buyers. The outside lead market now is quotable at 3.70c, St. Louis, of 3.85c, New York.

In view of the lead reduction, consumers had become suspicious of the recent advances on copper and were inclined to expect a reaction in the price of this metal. To the surprise of the trade, however, a leading selling agency this afternoon advanced its asking price on electrolytic to 12.87½c, delivered 30 days. There have been sales at this figure; at the same time, the 12.75c quotation has not yet been abandoned by all sellers, so that the market at present is indicated by the range between the two figures. There is talk of further million pound purchases by Connecticut consumers who are said to be covering requirements on further large orders originating in the wants of the belligerent powers in Europe. Lake producers are asking 13c, cash New York, on good ordinary brands but say they have not yet booked any business at this figure.

Demand for spot tin continues very dull, but there is a lively demand for future positions, particularly for far off futures. Quotations today are as follows: Spot, 33.37½c; immediate shipment from London, 33c; December from London, 32.87½c; January from London, 32.50c; all shipments from the Straits 32.25c. During November deliveries in this country totaled 2,600 tons, which compares with 2 800 tons the corresponding month last year. Stocks on dock and landing as of Nov. 30 were 2,026 tons, thus showing there is no danger of another immediate scarcity of spot.

The most active of the metals is spelter, which, due to a good foreign demand, and an improved domestic demand, is advancing in price. Today the market on prime western brands is 5.20c to 5.25c, St. Louis, or 5.35c to 5.40c, New York.

There is very little activity in aluminum and antimony; prices on the latter metal have softened somewhat and the market may be quoted: Cookson's, 16½c, duty paid; Hallett's 15c to 15½c; Chinese and Japanese 13½c.

Exhaust Steam Turbine Practice

How This Power Generating Unit Can Be Used to Advantage in the Iron, Steel and Metal-Working Industries

BY C A TUPPER

IN THE iron, steel and metal-working industries an active interest has been aroused, within the past few years, in the possibilities of exhaust steam turbines for increasing, at relatively low cost, the capacities of existing power plants, especially where a number of steam units have been installed for differing classes of service. From the practical operating standpoint, however, there are numerous conditions to be taken into account when considering the net economy of using such turbines; and the question of the type of machine to be recommended is important. This problem is one that only can be answered with any degree of certainty after a thorough analysis of the layout and service conditions of the particular plant involved.

Determining Factors

In cases of intermittent, but periodically regular operation, as in mills where reversing engines are used, or in other places where there is little to be gained by running condensing, the usefulness of the exhaust steam turbines has been demonstrated in a spectacular manner; but for ordinary power units, blowing engines, compressors, direct-acting pumps and pumping engines, etc., where the steam cylinders are ordinarily connected to condensers, the determining factors include:

Present arrangement of the plant or group of plants, with all dimensions affecting the installation of additional machinery and auxiliaries.

Number and types of boilers; systems of feeding and stoking; normal working capacity; safe maximum capacity; condition of boilers and probable life; facilities afforded by the boiler plant for expansion or vice versa; steam; steam pressure carried; superheat.

Type and rated capacity of each steam unit; if reciprocating, whether simple, compound or triple; if high pressure turbine, whether impulse, reaction or combined system; receiving and exhaust pressures; condensing or non-condensing.

Continuous overload capacity of each, considered with generators, if any; temporary overload capacities; steam consumption per unit of power.

Character of service in each case, whether steady, periodic or intermittent, and frequency of exhaust.

Condition of each steam unit; probable life.

Number and character of steam auxiliaries; their steam consumption; exhaust available from auxiliaries; condition of each auxiliary and what proportion of capacity utilized.

Quantity of steam used for heating, hammers, presses, gas producers or other purposes about the works, and how taken.

Total volume of exhaust steam available for each of the 24 hours of the day.

Probable or possible need of regenerator; necessity of providing for use in low pressure system of some live steam.

The Condensing System

Character of condensing system installed; altitude of plant above sea level; character of condensing water, salt or fresh, clear, acid or muddy; quantity available; high and low water conditions; maximum, mean and minimum temperatures of injection water; possibilities to be taken advantage of in cooling; vacuum obtained and attainable; gain in efficiency from condensing system compared with expense from securing such efficiency.

Fluctuations in demand for power and its range during different periods of the day.

If electric service is included in the existing system, whether alternating or direct current or proportion of

FIG. 1—MIXED PRESSURE, GENERAL ELECTRIC TURBINE DRIVING TWO DIRECT CURRENT GENERATORS IN THE POWER PLANT OF THE PITTSBURGH STEEL CO., MONESSEN, PA.

each; how apportioned among units.

Volume and character of additional power required; how it is to be distributed among the regular operating departments of the works and auxiliary service such as pumping, compressing air, haulage, driving shop tools, etc.

Cost of exhaust steam unit or units, basis purchase, maintenance and depreciation.

Cost of low pressure turbine unit or units on same basis.

Value of retaining spare unit or units, or providing for additional

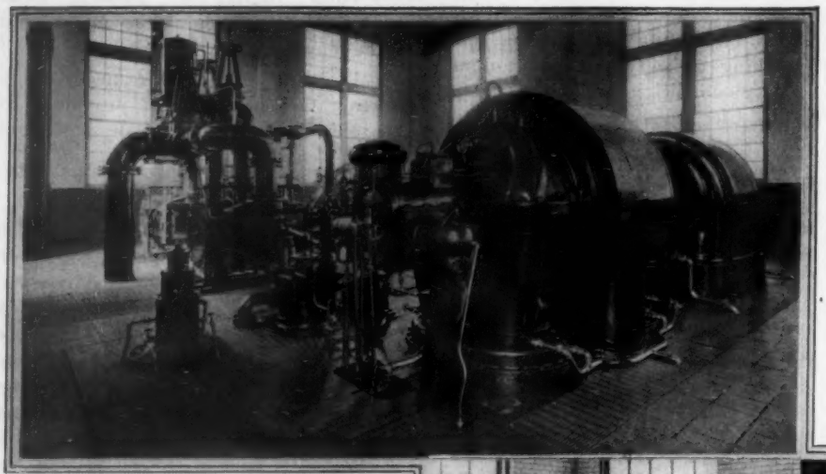


FIG. 2—WESTINGHOUSE LOW PRESSURE TURBINE AT PRESSED STEEL CAR CO.'S WORKS, McKEES ROCKS, PA.

"stand-by" machines.

Probable growth in demand for power, year by year, as far ahead as can reasonably be estimated.

Possibility of developing natural power in vicinity, as from underground gas or waterfall.

Opportunities for utilizing fuel wholly or partially wasted, as blast furnace or coke oven gas, nearby colliery refuse, etc.

Cost of additional power and net reduction or increase per horsepower-hour for entire system, from installation of exhaust steam turbine as compared with other possible arrangements.

Solving the Problem

This, of course, involves a mass of detail to be gone over, and in many cases, the conditions favoring exhaust steam turbines will be so obvious that only a few of the questions need be answered before a decision is reached. Nevertheless, it will pay to carry such an examination of the power system through to the end, for the analysis cannot help but be of value in many ways. Too many power plants are laid out or extended with only a limited knowledge of essential conditions and without proper regard for the future.

As a general rule, it is safe to assume that in power plants of any size where two or more high pressure units are installed—or even one large unit—an exhaust steam turbine can be utilized to advantage in securing needed increase in capacity; but in a small plant equipped with only one engine, which has perhaps seen years of service, wisdom will often dictate the purchase of a new compound condensing engine or standard high

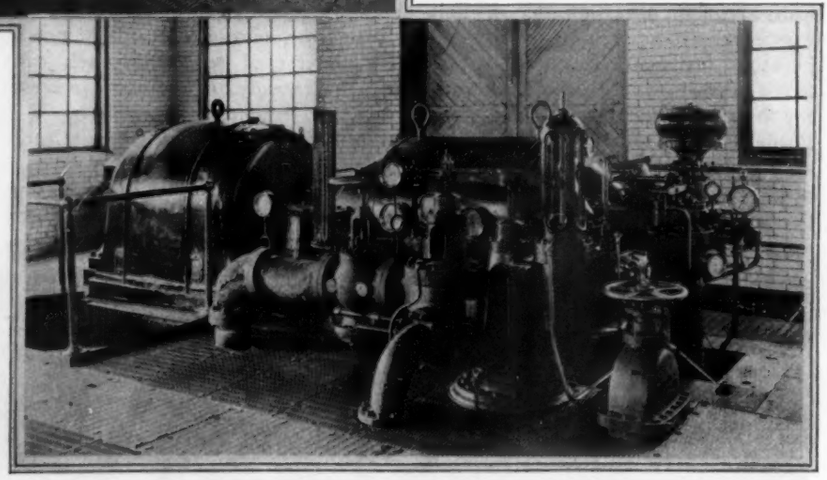


FIG. 3—LOW PRESSURE TURBINE, REPUBLIC IRON & STEEL CO., YOUNGSTOWN, O.

pressure turbine and retaining the old engine to help out on overloads or serve as a reserve unit.

In this connection it should be remembered that the effective range of pressure in an exhaust steam turbine is small, rarely more than 15 pounds; hence, a good vacuum is of far greater importance than with any other type of steam power generator. As an illustration: The available energy in steam at 16 pounds absolute is 22 per cent less if expanded to a 26-inch vacuum than if a 28-inch vacuum is secured. Accordingly, unless a vacuum equivalent to at least 26 inches—not absolute but referred to a 30-inch barometer—can be economically maintained, the installation of a low pressure turbine is hardly warranted unless under exceptional circumstances. Moreover, the condensing system must be reliable, as exhaust steam units do not operate without vacuum.

Making Comparisons

In judging the relative merits of engines and turbines, it is a common fallacy to compare the results from a turbine operating under very high vacuum with those obtained by an engine with a poor vacuum. In the case of a low or mixed pressure turbine it is especially important to avoid any erroneous comparison of this kind. To maintain the same degree of vacuum, when condensing a given weight of steam under similar conditions, will cost practically the same in power and equipment, whether such steam be exhausted directly to the condenser from a high pressure engine or turbine unit or first passed through a low pressure turbine. This, therefore, is a problem to which close attention should be given; but all of the factors enumerated, separately and together, should have careful consideration if the best possible results are to be secured.

For the operation of a low pressure turbine in conjunction with one or more reciprocating engines, one of four general methods are commonly employed. These, in turn, may be subject to various modifications, depending upon local conditions. They are:

(1) Where the load on the engines is comparatively steady and the complete utilization of all the exhaust

steam is not essential, but an approach to this condition is desired, the engines are run with a back-pressure limited by a suitable valve and their exhaust is admitted to the turbine under governor control. This method accommodates itself to almost any class of power generation, although it does not permit the attainment of the highest possible efficiency.

Utilization of the Exhaust

(2) Where conditions are somewhat similar to those last mentioned, but circumstances render it impossible to install low pressure turbine capacity sufficient to utilize as completely the full quantity of the engine exhaust, the low pressure turbine may be adjusted, by means of a suitable valve, to take a constant quantity of steam at a constant initial pressure, and thus to carry a constant load, the excess exhaust being discharged into the atmosphere through a back-pressure valve.

(3) Where the operation of the engines is intermittent, as in rolling mill and hoisting service, the engines exhaust against a practically constant back pressure into a receiver or "regenerator", to which live steam is admitted through an automatic reducing valve, and in which a constant steam supply for the use of the turbine is thus maintained, even though the interruption in the supply of exhaust steam from the engines should extend beyond the maximum period for which the regenerator has storage capacity. To illustrate the action of a regenerator, the following case cited by a well known authority is given:

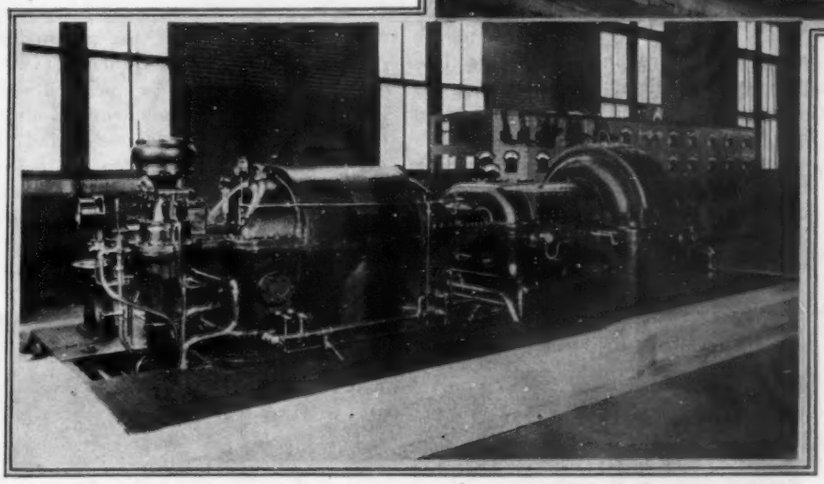


FIG. 4—LOW PRESSURE TURBINE IN LOUISVILLE & NASHVILLE RAILROAD SHOPS, LOUISVILLE, KY.

Assuming that the pressure limits for its operation are 14.7 pounds and 25 pounds absolute; that is, atmospheric pressure and 10 pounds gage, the corresponding temperatures will be 212 and 240 degrees Fahr., the difference between which is 28 degrees. Assume that the water with which the regenerator is partially filled is at 212 degrees and the steam at a corresponding pressure, and that the steam delivered by the reciprocating engine is exactly equal to the demands of the low pressure turbine. So long as this condition exists the steam flows through the water in the regenerator and no heat is taken up or given out. Now assume the load on the engine, and consequently the quantity of steam it exhausts to increase, while the demand of the turbine for steam remains constant. Then the pressure within the regenerator and, consequently, the temperature of the steam will begin to rise, resulting in an increase in the temperature of the water if provision has been made for intimately mixing the steam with it. As the pressure increases, the steam comes in at a temperature higher than the water and is in part condensed, which tends to maintain a temperature in the water corresponding to that of the steam. This process may continue until the pressure within the generator reaches 25 pounds, at which point a relief valve is set. Under these conditions, each pound of water within the regenerator will have absorbed 28.3 heat units. Now suppose the flow of exhaust steam from the engine to cease; then the pressure in the regenerator will begin to fall, because the turbine continues to draw steam from it. When this pressure has reached 14.7 pounds the water in the regenerator will have evaporated until its temperature corresponds to that of steam at this pressure, 212 degrees, and each pound of water in the regenerator will have given out 28.3 heat units, exactly equivalent to the amount absorbed while the pressure was rising. The mean latent heat of evaporation through this range being 961 units, each pound of water so reduced in temperature will liberate 0.0294 pound of steam.

When installing a regenerator one of the most important points to determine is the length of time it will be required to carry the full turbine load without any supply of steam from the engine or engines; if this is apt to be of long duration, the quantity of water in the regenerator must be correspondingly great. However, the pressure limits assumed in the example cited are quite wide. In a good many installations it would not be possible to impose 10 pounds back pressure on the engines. Frequently, in installing a regenerator, the disposition is to make the time element much greater than necessary. Some early cases provide for six or seven minutes of operation without a supply of exhaust steam, whereas six or seven seconds would come nearer actual service conditions. In steel mill practice, for instance, if the exhaust from a blooming mill engine is to be considered, the time element should be computed from the period between the passes of an ingot, and from the maximum time intervening between the final pass of one ingot and the first pass of a new ingot. The regenerator need not be designed to cover delays which arise from clog-

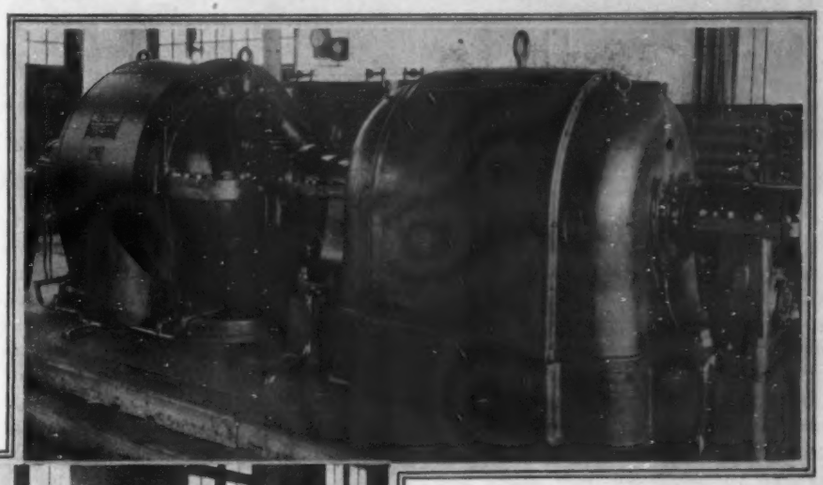


FIG. 5—WESTINGHOUSE LOW PRESSURE TURBINE IN PLANT OF AMERICAN IRON & STEEL MFG. CO., LEBANON, PA.

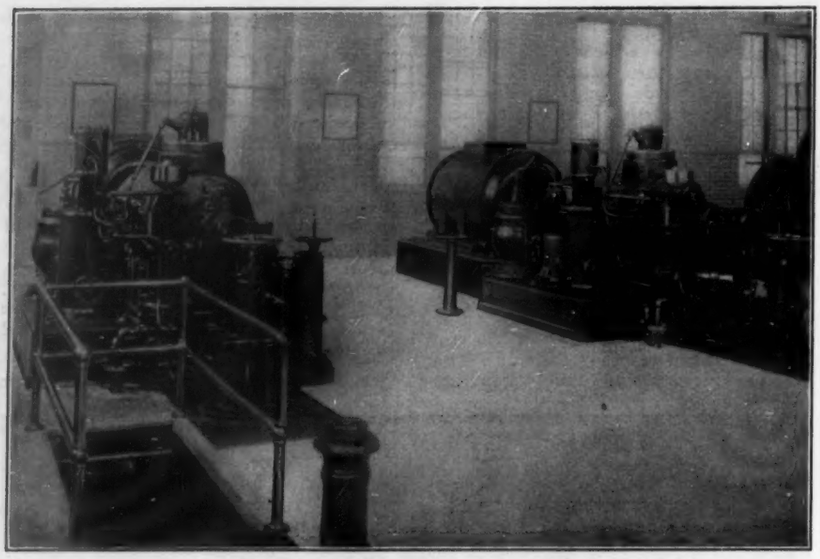


FIG. 6—ALLIS-CHALMERS LOW PRESSURE TURBINES INSTALLED IN EASTERN ALLOY AND CHEMICAL WORKS

ging of the mills or interruptions from any cause, as breakdowns or delays in furnishing ingots for blooming. Such contingencies are provided for ordinarily by taking live steam through a by-pass from the engine feeder pipe, either directly through a reducing valve or through another reducing valve admitting the live steam to the regenerator.

Admitting Live Steam

There will always be periods when the exhaust from the engine and possibly other prime movers connected up in the system will not be sufficient for carrying the turbine load, and the only recourse is to admit live steam. This may be accomplished by taking it through a reducing valve, as mentioned, so set as to admit steam to the regenerator when the pressure in the latter reaches the prescribed minimum; or preferably, perhaps, placing this valve under the control of the turbine governor. Various modifications of the practice, each of which has certain advantages or disadvantages for certain conditions, have been worked out, including the by-passing of the regenerator altogether as referred to above for emergencies. In the latter case it is necessary to install a check valve between the regenerator and the place in the turbine feeder pipe where the live steam is admitted.

For large power systems the most important of the four general methods of operation mentioned in the foregoing is where (4) the engines and turbine or turbines installed together drive electric generators on the same circuit, the turbine unit or units being "floated on the line". This means that the engine and turbine sets are tied together electrically, the turbine in each instance operating without governor regulation. It has only a safety stop to prevent running away in case of an accident or some unusual condition. With this method the back pressure on the engine and the inlet pressure to each exhaust steam turbine are always equal to the release pressure in the engine low pressure cylinders, less the drop to overcome port and pipe friction, and rise and fall with the load, the two or more units automatically dividing the load between them. The speed regulation is effected entirely by the governors of the engines. If the electric current is alternating, its frequency holds the engine and turbine units to speed. If direct current is being generated by the engine set or sets and alternating current by the turbine set or sets, all being connected to the same circuit through a rotary converter or motor generator set, the speed control is effected by a division of the load. For example, if a change of station load results in the turbine running ahead of the engine—taking a pair of machines as a convenient illustration—the slight increase in its speed causes it to take a greater share of the load, reducing the pull on the engine. The latter then speeds up, cuts off shorter and, by so doing, reduces its exhaust pressure and, therefore, the initial pressure at the turbine, causing the turbine to slow down slightly and to throw part of the load back on the engine. This automatic adjustment of loads takes place with such slight variations that no "see-sawing" of load or speed is noticeable, although slight but harmless cross currents may be perceptible in the switchboard instruments.

Speed Regulating Governor

Even though intended to operate without governor control, the provision of a speed regulating governor, entirely distinct from the automatic over-speed stop, is advisable. It will permit the turbine to be operated with live steam as an independent unit, when desirable or necessary; and it may be so adjusted that, in the event of the failure of the engine governor, it will hold alternating current units at a speed slightly in excess of normal, yet below that at which the auto-

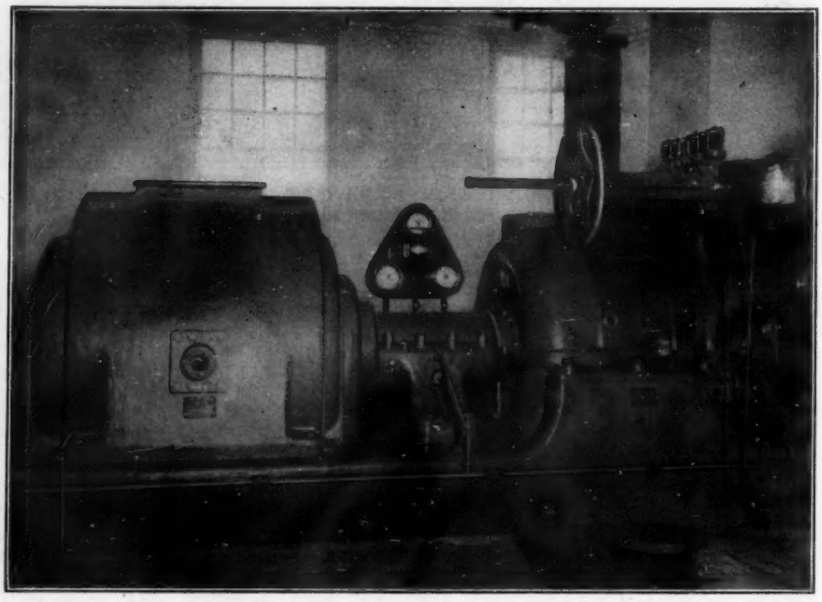


FIG. 7—MIXED PRESSURE, GENERAL ELECTRIC TURBINE INSTALLED BY YOUNGSTOWN SHEET & TUBE CO., YOUNGSTOWN, O.

matic stop would act, and will thus avoid any interruption of service by merely transferring the speed regulation from the engine to the turbine. In plants of any considerable size it is often desirable, also, to install one low-pressure turbine for each engine, with a separate condenser for each of these pairs. Each engine-turbine unit then will be comparable to a simple engine which has been compounded by the addition of a low pressure cylinder, as is occasionally done in mill practice, the only difference being that the two portions are tied together electrically instead of by a common driving shaft.

Installation of Synchronous Generator-Motor

With engines and turbines driving electric generators of different characteristics, as previously referred to, a combination of mechanical and electrical connection is to install a synchronous generator-motor, driven directly or by belting from one of the engines operating a direct current generator. This machine will act as a balancer, serving as a motor to give energy to or as a generator to take energy from the direct current system. Naturally, it must have sufficient capacity for the maximum unbalancing of the direct and alternating current loads. Such a device also can be used where the engine is a prime mover for shafting or belt or rope drive to apparatus other than electrical and the exhaust steam turbine set furnishes current for motors and lights. The variety of applications possible will be obvious.

A fifth method which might be referred to is that involved where the turbine cannot be made to help out the engine load to any advantage, or vice versa, and the latter may not require as much exhaust steam as is sometimes available. The engines then are arranged for operating partially condensing. The turbine governor, which in this case is indispensable, controls a valve which by-passes to the condensing plant all surplus exhaust, and with no load on the turbine this valve remains wide open, so that the engine or engines operate with substantially full vacuum.

In some plants there may be exhaust steam from intermittently-operated engines, from various steam auxiliaries such as compressors, pumps, etc., and even from manufacturing processes, where the supply for a low-pressure turbine is insufficient or unavailable for comparatively long periods. Any turbine designed merely as a low-pressure unit will, however, be inefficient in using live steam, since its expansive energy is wasted in throttling and only a small proportion is recovered from the resultant superheat. The conditions referred to, therefore, are met by providing what is known as a "mixed-pressure" turbine equipped with additional and distinct high pressure stages in which such live steam can perform useful work in expanding from boiler pressure. The low pressure stages are similar to those of the regular low pressure turbine, and to them the exhaust steam is admitted directly without passing through the high pressure stages. The high-pressure and the low-pressure inlets are both automatically controlled by one governing device. Naturally, this type of turbine, when operating with low pressure steam alone is not as efficient as the simple low pressure turbine, in consequence of the windage losses and dead load of the high pressure element.

Manufacturers of the Curtis impulse type of turbine have met this problem by building mixed pressure units without using any additional wheels or buckets. This is accomplished with a separate set of high pressure nozzles which direct steam to the same wheel as the low pressure nozzles, thereby eliminating the friction, weight and windage of an extra high

(*Continued on page* 1060b)

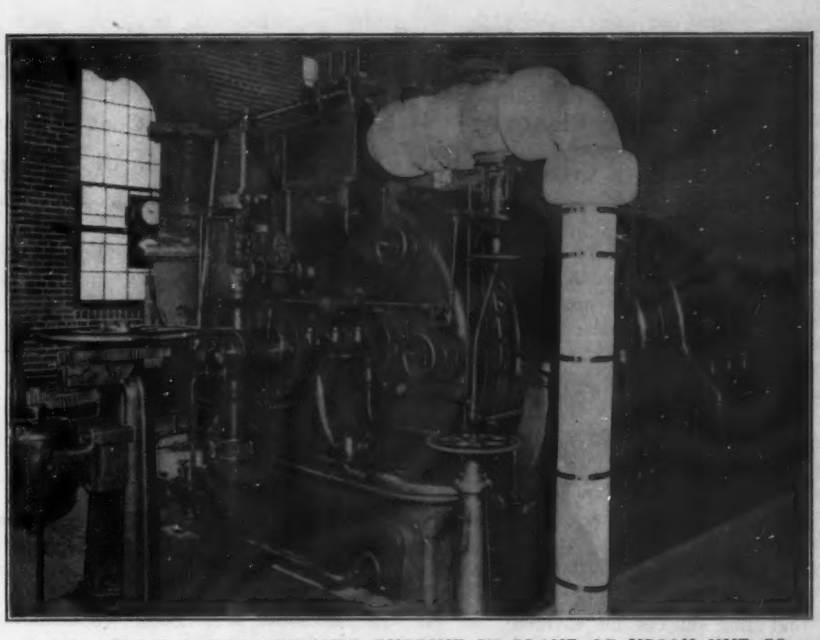


FIG. 9—CURTIS MIXED PRESSURE TURBINE IN PLANT OF UPSON NUT CO., CLEVELAND.

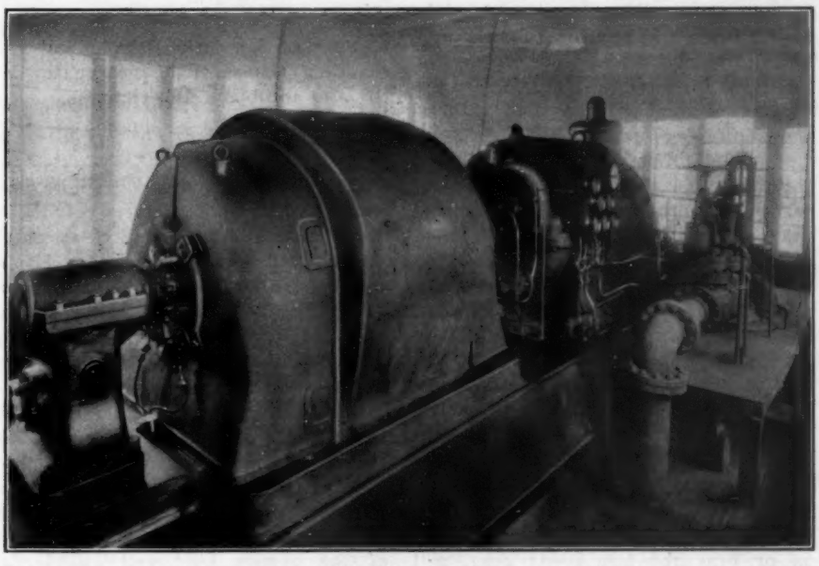


FIG. 8—WESTINGHOUSE LOW PRESSURE TURBINE AT WORKS OF DE FOREST SHEET & TIN PLATE CO., NILES, O.

Proper Painting for Steel Work

Many Plants Are Careless About the First Coat of Paint on Structural Steel, Which Results in Trouble With All Subsequent Coats

The consumer of steel is always prompt to discover defects in material or shop practice and frequently the most pertinent hints regarding necessary reforms in operating methods come from those who are interested in steel only from a user's standpoint. The accompanying paper, presented as a part of the report of the committee on iron and steel structures at a recent meeting of the American Railway Engineering Association in Chicago, includes some interesting criticisms of the painting methods of some structural mills and fabricating plants. The important function of the first coat of paint is pointed out and the necessity for the exercise of care in the paint department is emphasized.

The data which are given were compiled originally by the American Railway Bridge and Building Association.

AS A number of separate and distinct operations are necessary in proper performance of a job of structural steel painting it appears best that the subject be divided and the different stages separately presented. Also, in this discussion, the process of coating new steel, and the work of repainting old structures should not be confused.

Scientific research and numerous practical tests have demonstrated the fact that certain paint pigments, though possessing excellent moisture repelling properties, will actually stimulate corrosion when applied directly to steel surfaces, while certain other pigments have a tendency to restrict and repress corrosion when used for primers and foundation coats. Because of this, we divide the pigments into rust retarding, and air and moisture excluding groups, using the first for priming and contact coats, and the latter for finishing and exposed outer surfaces. The pigments used in steel protective paints of the first kind are principally, red lead, oxides and the like, while carbons, lampblacks, graphite, etc., belong in the other class.

How to Mix Shop Coating

A rust retarding coat may be suitably compounded from red lead mixed with pure linseed oil. The average stock mixture may consist of from 25 to 30 pounds of red lead to the gallon of oil. This mixture can then be reduced to the proper consistency at the time of application. A small amount of turpentine added to this brush coating will greatly help in its manipulation and will also provide for proper penetration. Red lead should always be mixed at the time of its application, for it settles quite readily, as it is an extremely heavy pigment. If so desired, the settling can be retarded, to a certain degree, by the addition of a small amount of magnesium silicate in the proportion of about 20 pounds of red lead and 2½ to 3 pounds of asbestine pulp to the gallon of linseed oil. A small amount of turpentine should also be added to this mixture for the purpose mentioned above. A good workman is required to properly apply red lead paint because of its more or less difficult application.

Natural oxides have also grown to be very good for priming purposes, and very satisfactory results are recorded from their use. A number of consumers favor oxides because of their easier application and the less expert class of labor which is required to apply them. A saving of from 5 to 10 per cent, as compared with red lead paint, can thus be effected. Some concerns are using a combination of red lead and oxide and make good reports regarding it. A number of reliable paint firms have similarly composed products on the market, which are sold under certain trade names, and some concerns have adopted them as their standards.

Although quite extensively used in former years, linseed oil is rapidly losing favor. It appears to be a universal opinion that linseed oil is not a desirable material for the prime coating of metals when used without the addition of pigments. A foundation coat of linseed oil is very often the direct cause of peeling and blistering of the other several coatings applied over it. The oil is seldom dried enough to insure close adherence to the metal surface which it covers before the other paints are spread over it. When the subsequent coats of paint are spread, the solvents and oils in them are bound to soften to some extent the underlying coat of oil, and the moderate heat of the sun alone is sufficient to cause the whole film to draw up, blister, and finally peel. Too much oil in a paint coating, particularly when the surplus is in or near the foundation coat, will generally cause blistering and peeling, regardless of the pigments used in the coatings. If, on the other hand, the erection or final completion of an oil-coated structure should for some reason become delayed, this oil film, which deteriorates much faster than a paint coating, will have practically perished; its surface will be morbid and dead and will not have strength and stability enough to carry any subsequent coats, which when applied over this kind of a surface, will also peel.

Paints containing the same kinds of pigments as for shop coatings, can be successfully used for the first field coat, providing it is covered with another elastic outer coating. If that is not done, paints suitable for finishing coats should be applied, and the first field coat omitted. Red lead or oxide priming should be darkened for this coat by adding carbon or lampblack in the proportion of 90 to 95 per cent of the reds and 5 to 10 per cent of carbon mixed. The addition of this black will not only help to make the coating more elastic, but will act as a guide to determine if the former surface is being completely covered because of its darker shade and the shade is also brought nearer to the color of the black finish coating.

Use of Graphite Pigments

Carbon, lampblack and graphite pigments, singly or mixtures of them, have given best satisfaction as outer surface and finishing paints. These, combined with some inert and reinforcing pigments according to special formulas form the basis for nearly every satisfactory brand of metal paint on the market. The addition of some high grade gum like Kauri improves a finishing paint greatly, producing more elasticity, resistance and life. It is, of course, just as essential that the oils entering into the makeup and composition of the various paints are of the proper kind and quality, as that the selection and composition of pigments be properly made and store-

keepers or others charged with the duties of passing on the merit of goods purchased should be very alert and strict in regard to linseed oil. Paints containing tar, or those with a tar base, should not be used on steel structures exposed to the sun and weather, as tar-paint films rapidly check, crack and "alligator".

When for any reason it becomes necessary to repaint an iron or steel structure, the paint should never be applied in wet or freezing weather, and the surface should be freed absolutely from all scale, rust, dirt, etc. It is not sufficient to merely apply a fresh coat of paint over an old paint surface under which traces of paint corrosion appear, for while the new paint will cover up the old surface, and may adhere firmly to it, corrosion goes on beneath the paint just the same. Freeing from rust and corrosion and perfect cleaning are positively necessary. When for some reason it is not possible that the entire structure can receive a coat of some rust-retarding primer, the parts cleaned and freed from rust, and all the exposed surfaces, at least, should be touched up with either a red lead or oxide primer, before the finishing coat is given. The use of turpentine in the paint applied over the old surface is advised, as turpentine is a penetrant, providing the penetration and adhesion between the old paint film and the new coat.

Sand Blasting Desirable

Although more expensive, cleaning by sand blast is much more thorough than the hammer, chisel, scraper and wire brush method, and the greater cost is readily offset by better results in the end. The sand blast method thus far has not been very extensively used. Where the sand blast has been used and the steel has been painted promptly, it has not shown signs of corrosion again nearly as quickly as steel cleaned by hand.

Occasionally we notice defects showing up here and there on a steel structure within an unusually short time after the completion of the painting. On looking into the matter, we find that nothing extraordinary has occurred during the progress of the work. Everything has been handled in the usual way, the general course of mechanical procedure has been followed, and still improper results are appearing. We recall no acts of our own to which to lay the blame and are finally compelled to look for the cause previous to our own handling of the work, or to the priming, which was done at the works or in the mill. We are not certain beyond a doubt, so we decide to visit a mill, and there make personal observations, which may very probably result as follows: In one part of this enormous plant we find the inspector busy in the pursuit of his duties, checking, comparing specifications, testing, weighing and attending to the many details connected with his work. In the meantime, we notice in another remote part of the place a bunch of unskilled laborers mopping paint onto some steel that had been sent along for priming, using large 6-inch or 8-inch flat brushes, and covering over mill scale, rust, dirt and other imperfections, each and every one a destructive agent and an enemy to the life of steel. We observe all these stimulators of corrosion brushed over and covered up with paint, but not removed, and so the march of the corroding process is sure to go on. We next pay attention to the paint they are using and learn that the package, which was opened some time ago to be inspected and was left standing uncovered all this time, had contained the standard paint as specified, but now, through neglect is no longer fit for its purpose. On examining the contents of the package closely, we also notice that the paint is scarcely stirred up, and we see that the oily substance from the top of the mixture is first used, and as the work progresses and the material is consumed, the paint becomes heavier and intermixed with more or less pigment, until when the lower part of the package is reached nothing is left but a semi-dry pigment, which will no longer spread under the brush. Now, to assist in brushing, the men reach for the benzine can and reduce the paint with it, destroying what little life the paint had first contained. In this way a number of different surfaces and films are created on the same structure, and from the same package of the so-called protective coating.

We proceed further, and find at other parts of the mill, though this time under a covered shed, more laborers applying a shop coat to other sections and parts of the structural steel. Here we notice exhaust pipes of all kinds steadily discharging vapor and moisture, which firmly settles and deposits on the steel. Under such conditions the steel cannot be perfectly dry, however much it may appear so, yet the painting is done just the same; these layers of moisture are enclosed between the surface and the steel, and the paint, which is supposed to close the pores and firmly adhere to the steel, is merely attached in some places and spots, and a weak foundation is created which is absolutely unfit to receive and successfully hold subsequent coats of paint.

While we have gathered all this valuable information the inspector has found an opportunity to inspect the painting on these various sections of the steel. He looks at the job, and as it looks uniform in color, he regards it as properly done, because it is outwardly covered over with paint. The material is consequently passed, loaded and shipped.

The foregoing illustration may appear somewhat severely drawn, and the situation presented greatly exaggerated; nevertheless, if a number of troublesome cases were thoroughly sifted, the illustration, in part, or in whole, would be identical with the underlying cause of the trouble.

It must not be construed that our illustration is intended to cast any reflections upon the inspector or his methods. On the contrary, it is sought to imply that he uses his principal efforts in a direction considered primarily important, which is the correct fabrication of the parts composing the structure. No matter how diligent and untiring an inspector may be, it is not possible for him to be in a number of places at the same time, for, in large plants, where modern methods are pursued in the manufacture and assembling of steel, the various departments are sometimes miles apart.

Educating the Men

Of course, not all failures are due to work which was first painted at plants, for often, even among so-called intelligent mechanics, the belief still exists that anything in the way of paint is good enough for priming purposes, so long as it is going to be covered again with paint, thus entirely ignoring the fundamental principles of a correct foundation.

It may, therefore, be suggested that considerable attention be given to the education of men who supervise the erection and maintenance of steel structures, so that greater interest in the problem will be aroused, better co-operation between the various departments effected, and the proper men chosen to handle the different lines of work.

The General Electric Co. has just issued a bulletin describing small direct and alternating current motors of the drawn shell type. These are all fractional horsepower motors which have been specially designed for application to the diversified forms of small machines which may be driven by electric power. The range in capacity from 1/30 to ¼ horsepower, inclusive, and may be wound for either direct or alternating current. They are furnished for use on circuits of standard voltages.

For the Steel Worker Himself

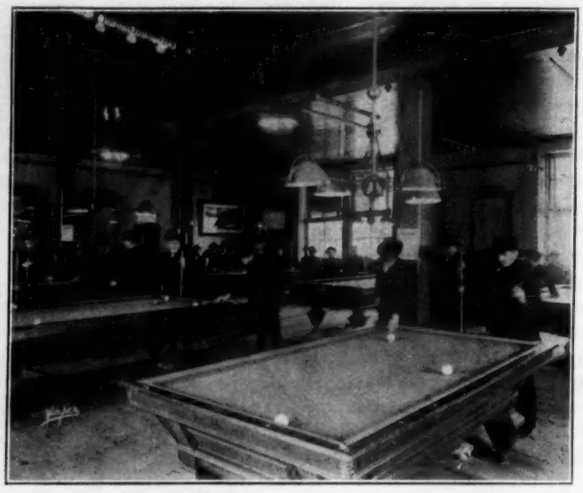
GOOD companionship and pleasant surroundings are relied on by steel company officials to awaken better characteristics in employes whose work necessarily is among surroundings in themselves hard and unlovely.

The human equation is such an important factor that it is becoming more and more important to keep up the personnel of an organization. We present herewith some striking views of what is being done for the workers in the mills of the Illinois Steel Co., at Joliet and Gary.

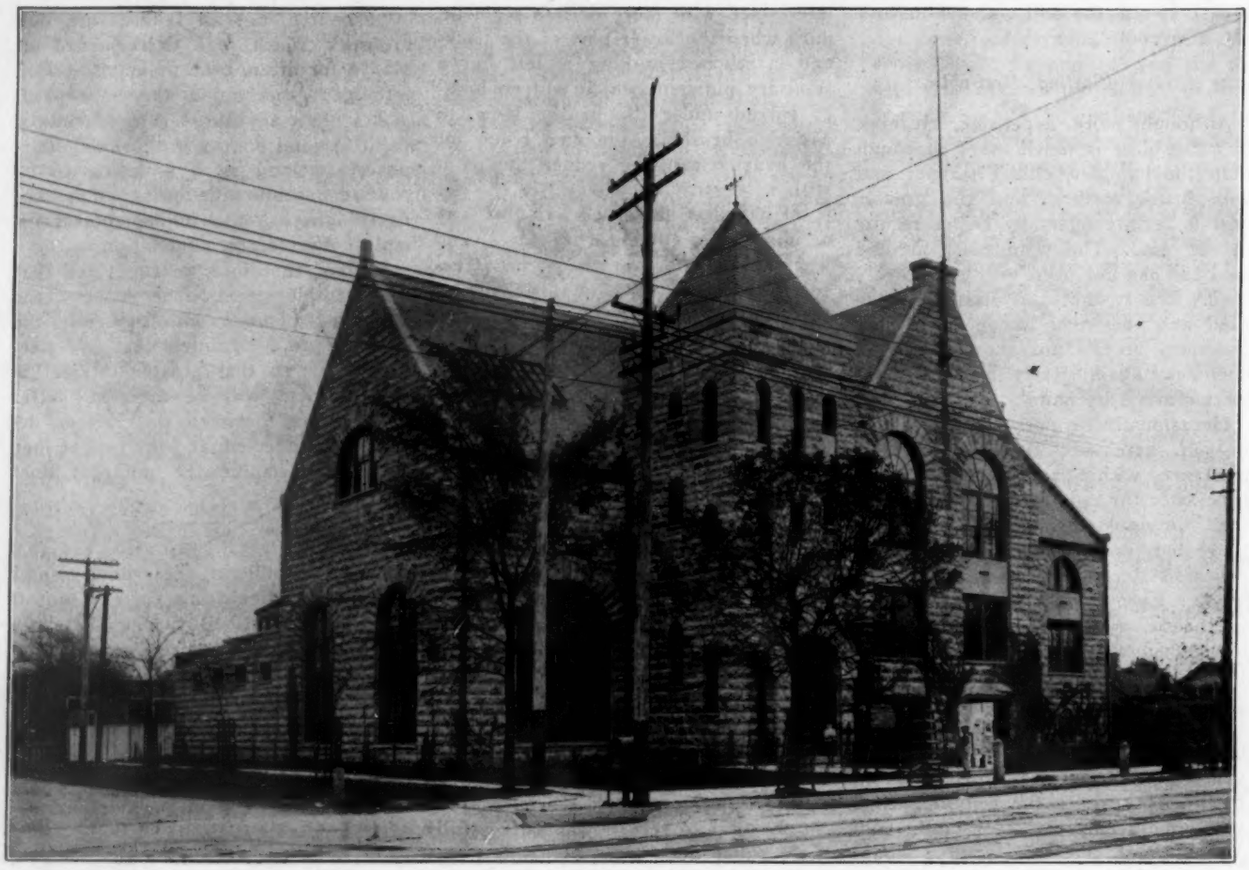
The Steel Works Club, at Joliet, is an imposing building and its interior will compare favorably with any city club. The men gather in the club when off duty and feel it is their own center. Connected with it are outdoor recreation grounds and tennis and football teams have won honors for the club in many contests with similar organizations.

Raising flowers, vines and other green things about a steel plant with

LIBRARY, STEEL WORKS CLUB, JOLIET



BILLIARD ROOM IN CLUB AT JOLIET

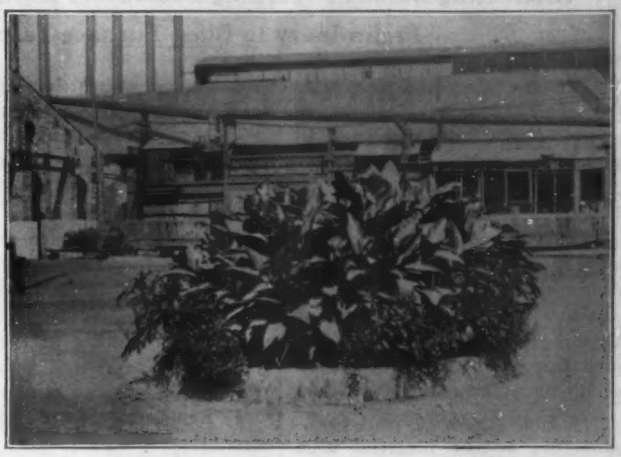


STEEL WORKS CLUB, JOLIET WORKS, ILLINOIS STEEL CO.

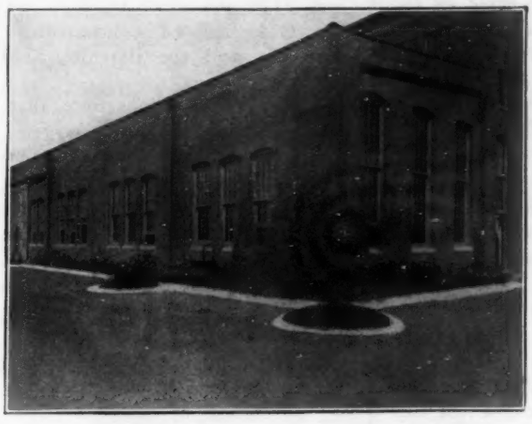
Beauty and Recreation Provided

its necessary dirt and grime might have seemed incongruous at one time but it is being done the country over now and wherever a corner presents itself where something will grow, the opportunity is improved. This work has converted much that is rough and uninteresting into restful and beautiful gardens. More and more effort of this character is being expended each year and the results have been all that had been expected.

Although this entails considerable expense it has been found a good investment in its effect on the morale of the workers, and taken with other efforts toward betterment has been paying dividends.

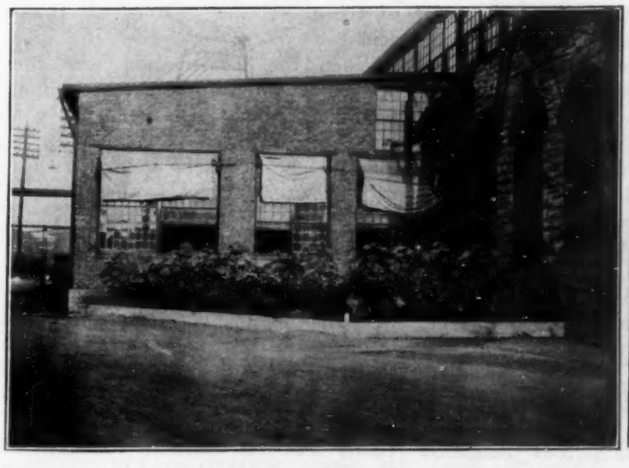


MAIN ROADWAY THROUGH PLANT
View at Joliet Works of the Illinois Steel Co.

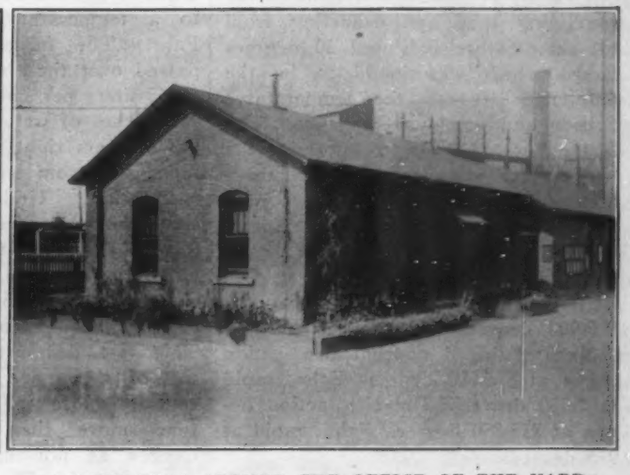


AN ATTRACTIVE SHOP LANDSCAPE
Flower Beds at Locomotive Repair Shop at Gary

FLOWER BEDS AT ENTRANCE TO PHYSICAL TESTING LABORATORY
View at Gary Works of the Illinois Steel Co.



FLOWER GARDEN AT MACHINE SHOP AND TOOL ROOM, JOLIET WORKS



FLOWER BEDS AROUND THE OFFICE OF THE YARD SUPERINTENDENT

Slags From Titaniferous Ores

Interesting Details Regarding Laboratory Experiments on Ores High in Titanium, Preliminary to Blast Furnace Tests at Port Henry, N. Y.

WHEN the MacIntyre Iron Co., owners of large deposits of titaniferous ore located in the township of Newcomb, Essex county, New York, decided to determine the commercial value of the ore by a practical test in a blast furnace, a preliminary investigation was made to determine the relative rapidity at which the ore lost oxygen compared with Witherbee, Sherman & Co. Old Bed concentrates, which ore had been the base of the mixture used at Port Henry.

The analyses of the material used in this test were:

	Sanford Concentrates.	Ilmenite.	Old Bed Concentrates.
Silica	2.26	1.72	4.90
Iron oxide	33.19	39.21	.....
Magnetic oxide	.....	.....	88.26
Ferric oxide	43.51	5.21	.....
Alumina	4.52	.65	1.62
Titanic oxide	12.34	49.10	.61
Manganese oxide	.27	.55	.12
Vanadic oxide	.47	Trace.	.....
Chromium oxide	.19	Trace.	.....
Lime	.10	Trace.	2.00
Magnesia	1.48	2.16	.33
Alkalies	Trace.	Trace.	.....
Phosphoric anhydride	.007	.009	1.391
Sulphur	.104	.158	.04
Carbonic anhydride	.36	.47	.....
Carbonaceous matter	.17	.13	.....
Combined water	1.45	1.11	.....
	100.421	100.477	99.271
Phosphorus	.003	.004	.624
Chromium	.134	Trace.	.....
Vanadium	.260	Trace.	.....
Manganese	.209	.426	.09
Titanium	7.40	29.46	.....
Metallic iron	56.29	34.13	63.90
Nickel	Possibly a trace; tests doubtful.		

The test was made by placing samples of Old Bed concentrates, Sanford concentrates and ilmenite, separated mechanically from Sanford tailings, in an electric ignition furnace. The temperatures were determined by placing a thermo-couple outside of the containing tube and deducting from the temperature indicated 50 degrees Fahr., which was found to be the difference between the temperatures outside and inside of the tube. The first experiment was to determine the temperature at which each of these ores began to give up oxygen to pure carbonic oxide and also the temperature at which chemical action began to be rapid. The results were: Old Bed concentrates, action began at 875-900 degrees Fahr, rapid at 1,100 degrees; Sanford concentrates, action began at 875-900 degrees Fahr., rapid at 1,050 degrees; Ilmenite, action began at 825-850 degrees Fahr., rapid at 975 degrees.

This test indicates that the titaniferous ore begins to reduce at no higher temperature than that at which the magnetic ore begins to reduce and that the action on the ilmenite begins at somewhat lower temperature.

A sample of gas was then drawn from the blast furnace from a point 21.5 feet below the tunnel head. This corresponds approximately with 10 feet below the average stock level and with a temperature in the furnace on 1,150 to 1,175 degrees Fahr.

Samples of Sanford concentrates, Old Ben concentrates and ilmenite were then placed in the combustion furnace tube, the tube filled with gas drawn from the furnace, and brought to a temperature of 1,150 degrees Fahr. The furnace gas was then passed over these samples at the rate of 45 liters per hour under a head of 16.5 inches of water. The current was passed from right to left for the first hour, and from left to right for the second hour. Under these conditions the Sanford concentrates lost 43.51 per cent of the total oxygen combined with its iron, the Old Bed concentrates lost 18.54 per cent of its oxygen, the ilmenite 4.82 per cent. This test demonstrates that in the top of a furnace the Sanford concentrates lose in the same unit of time more than twice as much oxygen as non-titaniferous magnetic concentrates. The loss of oxygen from ilmenite was so small as to indicate that probably only the magnetite which was not perfectly separated from it was reduced.

Slag Tests

Interesting details regarding experiments which were made by the McIntyre Iron Co. at Port Henry, N. Y., to determine the availability of high titanium ores for the manufacture of pig iron were given in an extensive article published in THE IRON TRADE REVIEW, *Oct.* 15. *A comprehensive paper on this subject was contributed to the proceedings of the seventh meeting of the American Iron and Steel Institute at Birmingham, Ala., Oct.* 29 *by F. E. Bachman, general manager, McIntyre Iron Co. This paper contained some data referring to slag tests which were not available at the time our previous article was published and this material is therefore presented herewith.*

The third experiment was to determine the relative action of carbon on the ores at the temperature at which reduction takes place by direct combination of carbon with the oxygen in the ore, namely, 1,300 degrees Fahr., and above. For this determination equal weights of ore and coke were placed in the ignition tube, the air in the tube replaced with carbonic oxide, and the temperature then brought to 1,300 degrees Fahr. The temperature was gradually raised to 1,450 degrees Fahr. through a period of two hours, during which time the atmosphere of carbonic oxide was maintained in the tube. The Sanford concentrates lost 51.81 per cent of their oxygen, the Old Bedford concentrates 22.66 per cent and the ilmenite 33.81 per cent.

These results demonstrate that Sanford concentrates lose oxygen more than twice as rapidly as non-titaniferous magnetic concentrates, and ilmenite 50 per cent more rapidly. This experiment, however, is of no special value as it does not correspond with any blast furnace reaction, in that solid carbon never begins to react on the oxygen of the ore until a large proportion of the more easily removable oxygen has been removed by the action of carbonic oxide.

A further preliminary investigation was made of the fluidity and melting points of slags of composition similar to those which were made at Port Henry in the regular furnace operations and of slag in which a portion of the silica was replaced by titanic acid.

When the investigation was conceived, it was supposed that conditions and apparatus in which the constituents of slags similar to those that will be produced in a blast furnace when smelting Sanford concentrates with Witherbee, Sherman & Co. concentrates, using for the flux a mixture of equal parts of the calcite and dolomite in use at Port Henry, would be obtainable. It was proposed to melt the mixtures which produce slags corresponding to those that will be made when using one-eighth, one-fourth, three-eights, one-half, five-eights and all Sanford concentrates in a mixture, together with a standard slag similar to the slag produced in

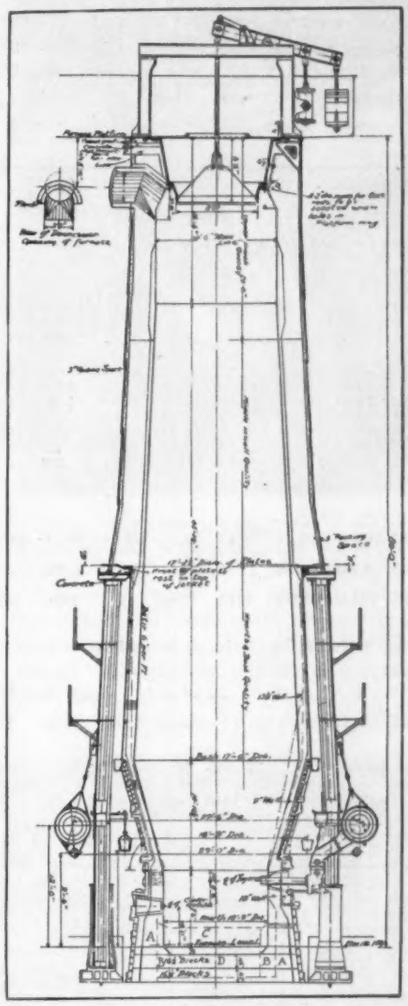
regular practice when using 100 per cent Witherbee, Sherman & Co. concentrates.

It was hoped to be able to melt the mixtures and bring them to the supposed temperature of the blast furnace hearth, holding them at that temperature long enough to observe their characteristics while melted, and then to pour them into runners under similar conditions in order to observe their flow, the length of the flow, size of the chilled section, etc. From the data obtained, conclusions were to be drawn regarding the probable result to be expected as far as the test corresponded to furnace conditions.

My conception of the formation of a blast furnace slag is that at a point approximately 25 feet above the tuyeres the minerals which have the lowest melting point in the ore begin to melt, then the free SiO_2 combines with FeO and with the melted minerals forms a fusible slag somewhat similar to heating furnace cinder. This slag flows down over the pieces of lime and coke, and when it reaches the hotter section of the furnace, the FeO is gradually reduced to Fe and replaced by CaO or by CaO and MgO from the lumps of burned stone. In front of and immediately above the tuyeres the coke ash is set free and combines with the slag produced above, and a portion of the lime not completely fluxed often passes below the tuyeres and is absorbed in the bath of slag in the hearth. If this conception is correct, it is of course impossible to duplicate the process. The only thing to be studied, therefore, were the slags after they had completely formed. Even in this I was not entirely successful. Besides very valuable aid in this work the Titanium Alloy Mfg. Co., Niagara Falls, N. Y., kindly gave me all of the facilities available at their plant in apparatus, assistance and advice.

After several experiments with various types of coke and electric furnaces, it was decided to use crucible turned from solid electrodes, in order to prevent contamination from the clay of graphite or other crucibles, and a carbon resistance furnace having a variable voltage, melting two charges per heat.

The furnace consisted of two 8-inch electrodes between which the crucibles, surrounded by small lumps of broken electrode, were placed. A mixture of 500 grams of the materials which would produce the slag desired was placed in each crucible. The mixture in one crucible made the standard slag, and that in the second the titaniferous slag. The mixtures were calculated to make slags corresponding to acidity of SiO plus AlO_3 plus three-fourths TiO_2, equaling in all 47 per cent. The materials used were quartz rock, burned lime, commercial alumina, rutile, magnesia from three sources, and calcium sulphide. The quartz rock only was analyzed. Owing to an error in the determination of the SiO_2 contents of the quartz rock, almost all of the slags were more acid than was desired. There are some reasons to suppose, however, that TiO_2 is not so much of an acid as figured, so the excess of acidity is probably more apparent than real.



VERTICAL SECTION OF PORT HENRY FURNACE

It was found to be impossible to bring the contents of both crucibles to even apparently the same temperature, or even to approximately measure the temperature with Seger cones, which were the only means available. But persons accustomed to observing high temperature, in some cases, guessed the heat at fully 1,600 degrees Cent. At this heat a No. 20 Seger cone held above the melt bent slightly, indicating 1,500 degrees Cent., with every indication that the lower portion of the crucible was decidedly hotter.

Table I gives the analyses of the slags, their specific gravity, the length each ran and their melting points.

After melting, the mixtures were poured into two runners made of the same material and having the same fall. Having completed the tests 1 to 7 inclusive, others with varying acidity and proportions of CaO and MgO were made.

Slags No. 5 and 6 were poured into damp sand runners which had a tendency to chill them more rapidly than the subsequent pours made in runners of graphite dust. The fall of the sand runners was 1 inch in 1 foot, of the graphite runners 1 inch in 2 feet 6 inches.

The conclusions drawn from these tests are:

1.—Assuming the pouring heats were approximately hearth temperature, slags corresponding to those produced when using one-eighth and one-fourth of the mixture of Sanford concentrates are more fluid than those produced at Port Henry. They were as rapidly melted in the crucible, did not stick to a cold rod more or less than standard slags, and showed no indications of greater viscosity.

2.—The slag No. 3 contains TiO_2 corresponding to more nearly five-sixteenths than to three-eighths Sanford concentrates. This slag also was better in every way than the non-titaniferous slag melted beside it.

3.—Slag No. 4 corresponding to one-half Sanford concentrates, was both sticky and mushy in the crucible and when poured refused to run. The temperature at which this slag was poured was apparently higher than that at which the other slags were poured. Reference to its acidity shows it to be decidedly more basic than those referred to above. When smelting it boiled and a scum, which refused to melt, formed on its surface. Supposing an error had been made in weighing the materials for this slag, other slags were made up, 4A, 4B, 4C and 4D, with varying acidity and varying lime and magnesia proportions. These will be referred to later.

4.—Slag No. 5, corresponding to five-eighths Sanford concentrates, showed rather more TiO_2 than it should. It melted freely. A slight scum formed on the surface but it quickly disappeared as the heat was raised. It stuck to a cold rod more than any of the slags referred to above and when poured flowed freely for a short distance and then set

very suddenly. It did not have the fluidity of the standard slag melted at the same heat.

5.—Slag No. 6, corresponding to 100 per cent Sanford concentrates, showed all the characteristics of No. 5 except that more scum formed on its surface and the scum did not entirely disappear on raising the heat. The slag felt sticky when stirred with an iron rod and adhered to the rod. From a furnace man's point of view it was an undesirable slag which, if possible to be worked at all, would be likely to give continuous trouble.

To further investigate the slag corresponding to one-half Sanford concentrates, slags 4A, 4A plus 5 per cent fluorspar, 4B, 4C and 4D were made. In weighing the materials to make these slags the same amounts of Al_2O_3 and TiO_2 were used, in fact they were weighed without change of the weights on the balance. The variation in the percentage of Al_2O_3 is therefore, peculiar. The results were:

(a) 4A showed a slight scum on the surface which cleared up quickly. 4A plus 5 per cent fluorspar melted clear. Neither stuck to a rod. 4A was more fluid than any slag melted previously, excepting slags 1 and 2; 4A plus fluorspar was decidedly the most fluid slag made; had the runner been long enough, it would have flowed 6 feet or more.

(b) All the constituents of slags 4B and 4C as weighed were identical, excepting the CaO and MgO. Both of these slags gave off gas and boiled when melted, seeming to indicate that a reduction was taking place. 4B was viscous, stuck to a rod, and had a heavier scum which would not clear up; 4C was fluid in the crucible and the slight scum which formed cleared up. This slag did not stick to a rod and when poured it looked cooler than 4A and was slightly less fluid. 4B was a poor slag. This test indicates that increasing MgO increases fluidity.

(c) The same weights of all materials, excepting lime and magnesia were used in slags 6A and 6B. Both slags melted very hot and boiled in the crucible; 6A was mushy, stuck to the rod more than 6B, had a heavier scum, ran slowly, and was a decidedly poor unworkable slag; 6B showed the same characteristics but was less viscous. It also was a poor unworkable slag.

For the purpose of determining the effect of titanic slags on sulphur a mixture corresponding to 4A containing 3.50 per cent and 4D containing 5.20 per cent calcium sulphide was melted. After melting, 3.50 grams of cast iron borings were added on the top of each mixture. It will be noted that in each case one-half the calcium sulphide was apparently lost, a loss which shows in all the slags whether titaniferous or not. A subsequent analysis of the calcium sulphide proved it to be but 50 per cent pure. It would be expected that both of these slags would absorb sulphur from iron. The results obtained, however, were remarkable and unexplainable. The analyses are as follows:

Borings.	Si.	C.	Ti.	S.
Before melting.....	2.79	3.05	0.018	0.078
After melting, 4A..	1.45	5.37	1.62	0.026
After melting, 4D..	1.04	4.36	1.39	0.023

As the borings chilled the slag and were melted in an oxidizing atmosphere similar to conditions existing in a puddle furnace, the loss of Si may be explained by assuming that the action in the crucible was the same as in a puddle furnace. The absorption of carbon may have been due to excess heat resulting in absorption of carbon from the crucible. I, however, am not aware that such an absorption has ever been pointed out. The reduction of sulphur with slags of the acidity and sulphur contents given was to be expected. The reduction of titanium was wholly unexpected.

From all of our knowledge of titanium, including its strong affinity for oxygen and its formation temperature, it is to be expected that it will not reduce as readily as silicon. If, therefore, the temperature of this experiment was high enough to reduce titanium from a slag, it was to be expected that silicon would also be reduced.

The melting point of none of these slags was excessive; it corresponded to that found previously in the case of somewhat similar slags. The variations among the titaniferous slags are no greater than among the non-titaniferous ones.

Table I

ANALYSES, SPECIFIC GRAVITY, MELTING POINT AND FLUIDITY OF TITANIFEROUS SLAGS

Number of sample.....	1	2	3	4	4A	4B	4C	4D	5	6	6A	6B	7(2)	7(3)	9	12
Per cent of TiO_2.....	5	9	12	16	16	16	16	16	18	21	21	21	0	0	Blast Fce. Slag	..
Per cent of acidity ($Si_2 + Al_2O_3 + \frac{1}{4} TiO_2$)	48.10	49.65	48.91	45.52	47.51	51.67	53.51	49.15	57.97	49.40	48.31	All Dolomite	42.22	42.19	42.78	46.18
Silica	29.52	27.02	25.26	20.22	22.86	25.38	27.74	24.94	19.92	16.80	20.90	20.20	37.46	30.46	31.82	33.44
Titanic oxide	5.02	10.52	10.40	13.16	17.37	16.36	15.98	16.52	21.54	22.58	19.34	21.65	.....	.82	1.48	.....
Alumina	15.80	14.74	15.84	15.43	11.62	14.00	14.00	11.82	15.90	15.67	12.91	14.40	4.76	11.02	8.85	12.74
Iron oxide (FeO).....	.56	.43	.71	1.73	1.29	.43	.14	.86	1.72	.56	1.57	.....	1.15	1.15	.71	.86
Lime	36.43	33.73	34.76	38.19	33.10	39.03	25.28	32.86	30.80	31.42	42.08	23.85	41.53	45.36	41.23	39.03
Magnesia	9.96	9.43	10.43	10.28	11.29	2.26	14.44	9.50	9.17	9.82	2.15	16.92	12.82	8.34	10.94	9.28
Calcium sulphide	1.95	2.97	2.47	1.82	1.75	1.68	1.77	2.14	.29	1.31	1.34	1.35	1.27	1.65	2.23	3.96
Alkalies	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.56	.....	.....	.....	.....	.....
Carbon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.35	.....	.....	.....	.....	.....
Manganese oxide	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.20	.....
Total	99.24	98.84	99.87	100.83	99.28	99.14	99.35	98.64	99.34	98.16	101.20	98.37	98.99	98.80	98.46	99.31
Specific gravity	2.971	3.112	3.123	3.263	3.180	3.068	3.154	3.206	3.378	3.190	3.276	.....	3.073	3.104	3.014	.....
Melt'g point, Cent., deg.	1334	1285	1338	1328	1374	1373	1286	....	1406	1450	1434	1355	1355	1447	1321	1391
Fluidity*	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Length of flow (titaniferous)	5 5	5 1	3 9	0 9	5 1	2 2	4 6	. .	4 5	3 2	1 6	3 0	. .	. .	. .	. .
Length of flow (non-titaniferous)	4 5	3 11	3 1	2 11	. .	. .	. .	. .	5 2	5 1½	. .	. .	. .	. .	4 9	3 6

*The fall in the runner was 1 in. in 2 ft. 6 in., except in case of samples 5 and 6, where it was 1 in. in 1 ft.

NOTE:—Sample 4A fused with iron gave an analysis of 2.35 per cent calcium sulphide. Sample 10, remelted furnace slag, using one-half calcite and one-half dolomite, had a melting point of 1363 degress Cent.; using one-fourth calcite and three-fourths dolomite (sample 11), a melting point of 1310 degrees Cent.

Seattle Electric Steel Foundry

Details of Plant of Washington Iron Works, Including Foundry, Machine, Boiler and Forge Shops

BY F A CHURCHILL JR.

OPERATED continuously under one management for 32 years, with John M. Frink, its founder, until recently its active president and with his sons, Gerald Frink and Francis G. Frink, occupying respectively the positions of vice president, treasurer and secretary, the Washington Iron Works Co., of Seattle, now has one of the most complete plants of its kind on the Pacific coast. Employing 250 men in its pattern shop, forge shop, gray iron foundry, steel foundry, boiler shop and machine shop, it does a large northwest and Oriental business in logging and hoisting machinery, every part of which is made in the plant from the raw material. This company was a pioneer in developing the modern logging engine, and is one of the first in the United States to operate successfully an electric basic steel furnace on cold charges.

When the Frinks, in making extensive additions to their plant last year, announced that they would attempt to turn out commercial steel castings from cold charges of local scrap in an electric furnace, doubt was expressed as to the feasibility of the plan. But the furnace, designed and built in the works under the Girod patents, is said to have been successful from the start. Its product, which runs from one pound to three tons, is characterized by close grain, high tensile strength, uniformity and freedom from blowholes.

JOHN M. FRINK
Late President Washington Iron Works Co.

"For some years we were compelled to buy our high-grade open-hearth steel in the east," said Francis G. Frink, in discussing the installation, "and we finally determined to make our own castings. As our tonnage did not warrant the installation of an ordinary basic or acid open-hearth furnace, we were led to investigate the merits of electric furnaces such as are rapidly coming into use abroad and also in this country. As electric power, delivered at the desired voltage, is cheaper at Seattle than anywhere else in the United States, including Niagara Falls, and as an abundance of cheap steel melting scrap is obtainable on the Pacific coast, we were convinced that the installation of an electric furnace would be the wisest course, and investigation led us to select the Girod type."

The Washington Iron Works Co. was incorporated in 1882 and operated until the early nineties as a small repair business. In those days the northwest's extensive logging operations were carried on by means of cattle and the old-fashioned spool type of engines. One of the company's customers tried to adapt a drum hoisting engine to his logging work and reported the results of the experiment to J. M. Frink, who, realizing the value of the idea, set about to build such engines on a commer-

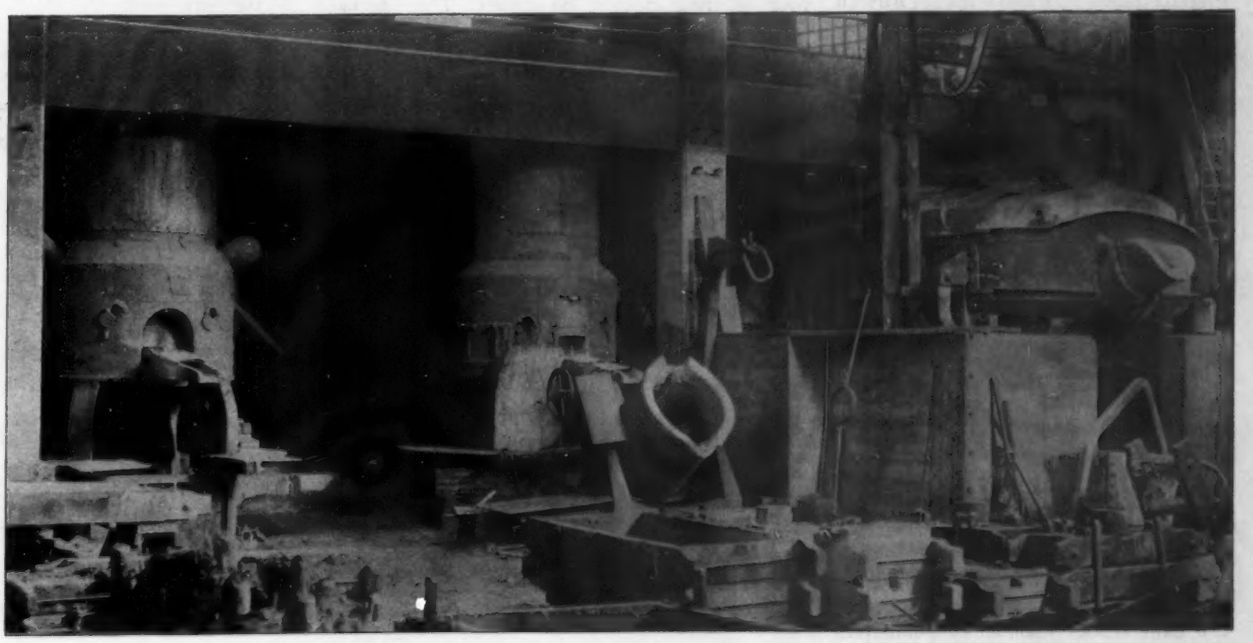


FIG. 1—MELTING EQUIPMENT IN FOUNDRY, SHOWING CUPOLAS AND ELECTRIC FURNACE

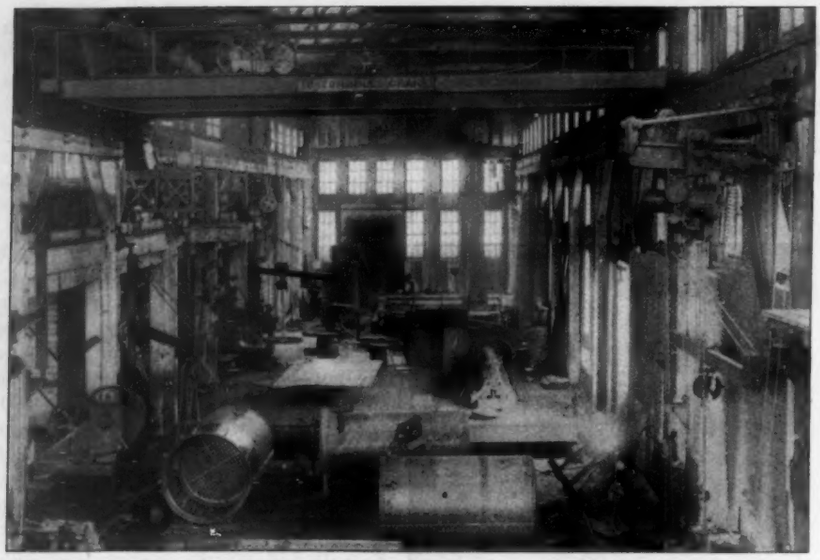


FIG. 2—LOOKING DOWN MAIN BAY OF BOILER SHOP

cial scale. Today the Washington logging engine, a rigid steel outfit in sizes as large as 40 tons and 350 horsepower, is used throughout the west and in the far east, being sold in Washington, Oregon, British Columbia, Alaska, Manila, Sinabang (Sumatra), Burmah and India. The manufacture of hoisting engines was undertaken in 1905 and recently some large electric units were furnished for placing concrete work on the Lake Washington-Puget Sound government canal at Seattle. Scraper hoists have been furnished for the Treadwell and Alaska-Gastineau placer mines in Alaska and machinery has been supplied for the New Westminster, B. C., harbor dredge, and for a United States snag boat used in Puget Sound tributaries. Fifteen years ago all of the company's product was used locally, whereas two-thirds of it now goes out of the state. Among the machines made by the Washington Iron Works Co. are electric and steam hoists from 8 to 350 horsepower, including pile-drivers, clamshell hoists, coal-handling, mining, contracting and excavating hoists, belt hoists, grabs, derrick irons, pile-driving hammers and equipment, miners' whims and blocks; also logging engines mostly of the ground-skidder type, including yarding and road engines in 20 sizes and types. Special engines for aerial logging, with logging blocks and other equipment, also are made.

General Arrangement of the Foundry

The works are located at Norman street on Seattle boulevard in the southerly manufacturing district of Seattle, and are connected by standard gage tracks with all railroad lines entering the city. The most interesting departments are the steel foundry and gray iron foundry, housed together in a solid reinforced concrete building 180 feet long and 240 feet wide. The sides and ends of the structure are practically all of glass with steel sash, and the roof is of the saw-tooth type, enabling the light to enter without throwing any shadows. Tracks serving the foundries come in on a level with the charging floors, thus saving a considerable sum in the handling of materials. Core and molding sands and pig iron are stored on the charging floor, the sand being delivered to the main floor by means of chutes.

The main bay of this shop, 60 feet wide, is served by a 15-ton Pawling & Harnischfeger traveling crane and four Whiting electric jib cranes. The battery of four core ovens, 30 by 12 feet in size, is of reinforced concrete. The foundry is equipped with two Whiting 60-inch cupolas. Other equipment includes one Central Iron Works cinder mill, two Tabor molding machines, one Wadsworth core machine, three Hanna pneumatic portable foundry screens, oxy-acetylene cutting apparatus, a heavy Milwaukee sprue-cutter, cold saws, rattler, sand crusher, mixer and an annealing furnace, 14 by 8 feet in dimensions, and operated by oil. The capacity of the iron foundry is 20 tons of gray iron castings daily.

The Electric Furnace

Situated at the southeast corner of the foundry, the electric steel furnace is supplied with 60-cycle single-phase, 13,000-volt current by the Puget Sound Traction, Light & Power Co., this current being stepped down in an adjacent outside transformer room by the electric company to 60 volts operating potential. The furnace is run on 5,000 amperes, and it takes about five hours to melt down and refine cold charges of three tons of scrap steel.

The furnace casing is made of steel plate in rectangular form with a magnesite-lined hearth, the lining being 24 inches thick. The roof is made of silica brick set in a frame of steel and is removable. The furnace sets in a cradle resting on rollers. A five-horsepower motor tilts it by operating a geared rack. A door at the rear serves for charging and slagging, while a teeming spout in front provides for tapping the furnace.

The most interesting part of the furnace is the arrangement of the

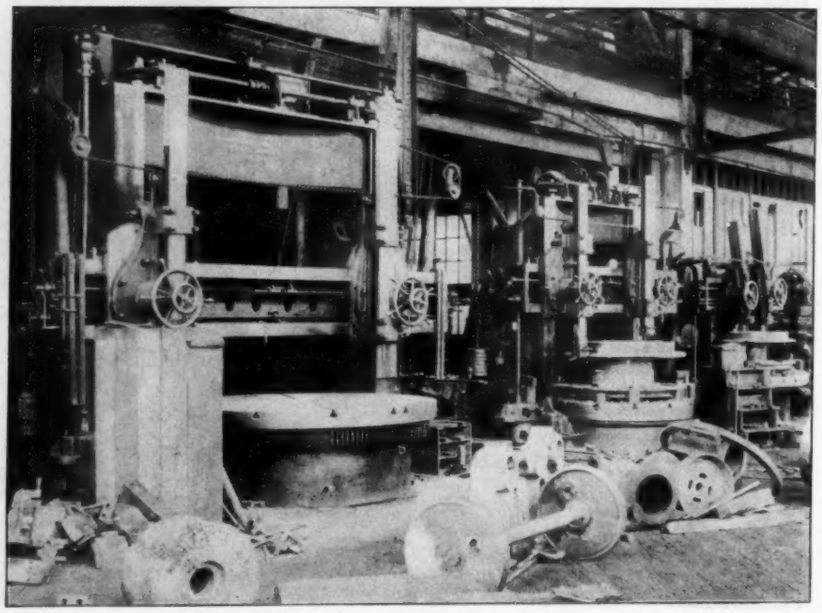


FIG. 3—HEAVY BORING MILLS IN MACHINE SHOP

electrodes. One pole, of carbon 16 inches thick, is placed above the bath, the other consists of a number of soft steel electrodes imbedded in the thick magnesite lining beneath the bath. In order to prevent these bottom electrodes from melting off too far, the parts protruding through the furnace bottom are water-cooled. During the operation a part of the electrodes melts away, until the cooling on one side is balanced by the heating on the other.

In operating the furnace, the current short circuits at nearly full voltage when the top electrode touches the top of the scrap charge. When the electrode is lifted clear, with the scrap almost entirely filling the interior of the furnace, the current path makes a multitude of small arcs between the various pieces of scrap, and short circuits are avoided. The whole charge thus gradually collapses and melts. The best results are obtained when the scrap is in small pieces, which increases the resistance and the number of little arcs. A layer of the smallest scrap is spread on the hearth in starting to furnish a good contact with the bottom electrodes.

The furnace is about 10 feet square; its capacity is 12 tons daily, scrap for charging being obtained locally. It is operated twice daily, but not at night nor on Sundays, being kept hot over Sunday by charging with coke.

The Machine Shop

The machine shop is 240 feet long and 120 feet wide, its main bay being served by a 30-ton Morgan Engineering Co. traveling crane and numerous jib cranes. A feature of the erecting floor, located in the main bay, is the gas babbitt heaters arranged conveniently in batteries. These were designed and built by the company and are supplied with gas from the city mains. The larger tools, located in the main bay, and all individually electric-driven, are as follows:

One 120-inch and one 72-inch Niles-Bement-Pond boring and turning mill, one 62-inch Bullard boring and turning mill, one 72-inch Schuchardt & Schutte gear-hobbing machine, one 72-inch Pond radial drill, one 42-inch Cincinnati belt-driven planer, one 36-inch Lodge & Shipley heavy engine lathe, one special heavy Beeman & Smith milling machine, one 18-inch Niles-Bement-Pond crank-slotting machine, one 48-inch Putnam planer and one 48-inch Lodge & Shipley engine lathe. Other equipment includes a Lucas Machine Tool Co. latest type horizontal boring, drilling and milling machine, a Warner & Swasey turret lathe, two Gisholt turret lathes, grinders, radial drills, milling machines, pipe machines, centering machines, keyseating machines, boring mills, bolt-cutters, cold saws and numerous small tools. On the testing floor of the machine shop all steam and electric hoists and logging engines undergo thorough tests. In the center of the machine shop is a tool room, fitted with drill grinders, cutter grinders, forges and lathes, where special tools are made and kept. A feature of this room is a specially constructed gas furnace with pyrometer attachment for the accurate tempering of tools. Special gages are used for tool-making.

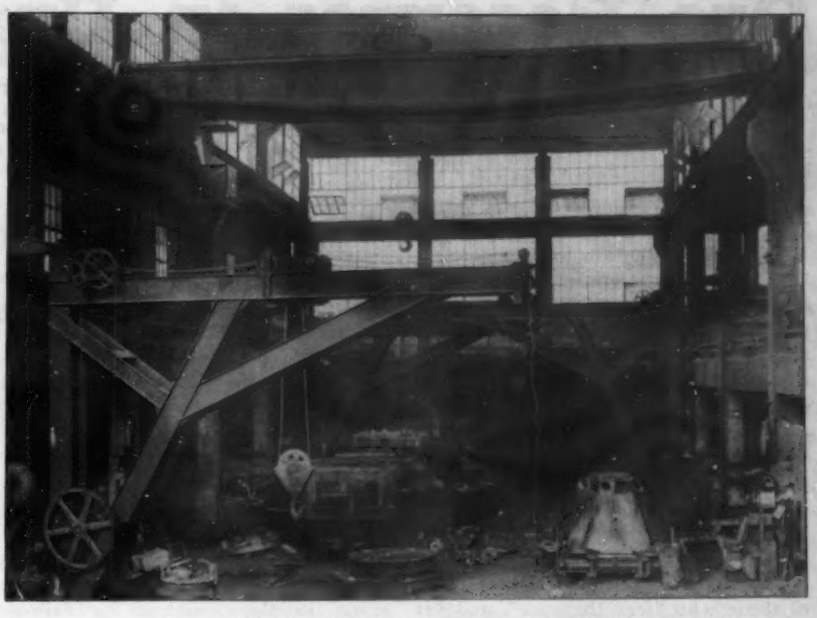


FIG. 5—JIB CRANES IN MAIN BAY OF FOUNDRY

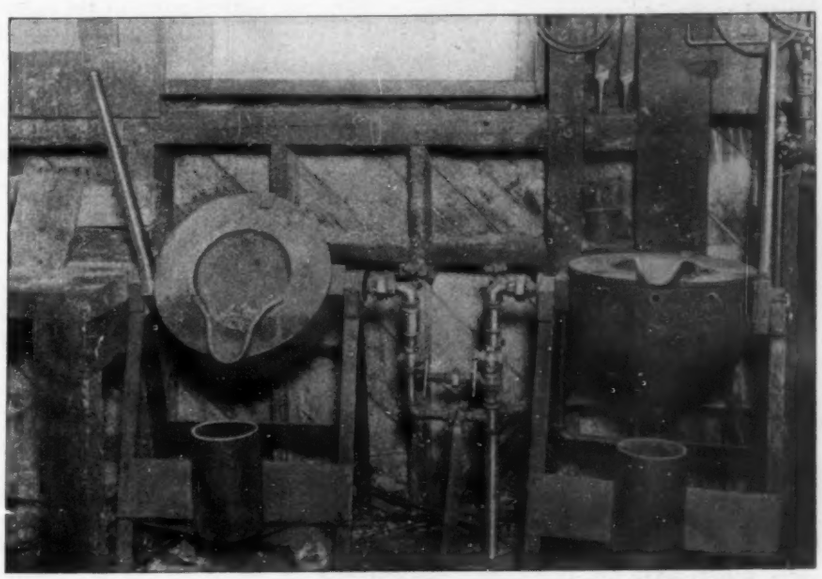


FIG. 4—GAS BABBITT HEATERS IN ERECTING DEPARTMENT

The forge shop, 70 feet square, has six blast forges made by the company, and one return-type oil furnace, also made by the company from its own designs. This furnace burns California crude oil and is operated in connection with a 1,500-pound Niles-Bement-Pond steam hammer and a 1,000-pound Morgan Engineering Co. steam hammer. The waste heat from the bloom furnace is utilized to generate steam for the forging hammers. Dies are used in this shop as much as possible for the economical production of the forgings used in the company's product.

Housed in a building 240 feet long and 80 feet wide, the larger tools of the boiler shop are located in the 40-foot main bay, which is served by one 10-ton Niles crane and one 10-ton Pawling & Harnischfeger crane, as well as numerous jib cranes. The tools in this department include one

(*Continued on page* 1050.)

Ore Reserves in United States

A Survey of the Reserves of Iron Ore in This Country With a Discussion of the Future Availability of Low-Grade Ores

BY JOHN BIRKINBINE

EXTENDED discussions, by inviting attention to problems affecting the conservation of natural resources, have encouraged investigations as to their sufficiency, with the general result that the more thorough the examination, the less cause appears for anxiety as to the exhaustion or serious depletion of these resources. The extent of industrial development, the large plants and the enormous volumes of materials required, when compared with conditions a few decades ago, are sufficiently startling to enlist the attention of those who "fear the pace", and yet in but few instances has real solicitude for the future been warranted by a knowledge of true conditions.

In making inventories of resources one is liable to confine conclusions as to availability upon present circumstances and conditions in the past, or to formulate data for the future upon methods which are rapidly being displaced. In reserves which are not reproductive, such as minerals, the possibilities of exhausting the supply are startling if estimates assume that future extensions will follow methods which were less economical than those now employed, or to be used, and we dare not claim that the limit of advanced practice has been attained.

Examinations and estimates of iron ore reserves may be taken as illustrative to determine whether an ample supply exists in our own country, or judge of the possibilities of liberal accretions which may be obtained from deposits of phenomenal character or size located elsewhere.

A retrospect of the history of iron production in the United States demonstrates that the location of industrial centers dependent upon the smelting of iron ores has materially changed, and that many blast furnaces, formerly relying upon local ores, now obtain their supplies from distant points. The abundance and quality of mineral has caused the greatest development during the past 20 or 30 years at localities to which ores from the Lake Superior region have been transported from rail to vessel, and again from vessel to rail to reach smelting plants; but other industries have been created to supply a demand in sections of the country which several decades ago offered but a limited market for manufactured products.

As population increases, as towns and cities grow, as railroads are extended in various parts of the country more or less sparsely inhabited, as water transportation is cheapened, and as requirements from other countries may make drafts upon or furnish material for the products of the United States, changes in industrial centers may be expected. We, therefore, may not limit consideration of the iron ore reserves solely as affecting the iron and steel industry as it now exists in this country, for railroad and water transportation cheapen the cost of delivering materials from distant points and facilitate the shipment of manufactured products.

Mechanical ingenuity, by displacing manual labor, admits of greatly augmented outputs and larger plants, while local industrial development is an early desire of growing communities.

Our iron ore reserves are to be estimated as supplying our present industries and also as encouraging the development of new enterprises in a country of vast area, rapidly increasing in population and in markets for iron and steel products.

Another factor apparently neglected is that but few iron ore mines have been worked to exhaustion, for inquiries covering several years failed to develop any considerable number of iron ore mines which could be classed as worked out.

But a careful review of the iron ore deposits of the United States, which have been or are wrought, shows remarkably few instances where the deposit has been "bottomed" or followed to its lateral termini; on the contrary, the testimony of those operating iron ore mines, proves that in the majority of instances the more a deposit is exploited, the greater are the apparent reserves. After nearly 60 years of activity, new "finds" of iron ore are reported from the Marquette range in Michigan, and the same is true of the Menominee range, which was opened 20 years subsequent to the Marquette range.

The Gogebic range of Michigan and Wisconsin, after a history of 30 years, has been demonstrated to possess enormous deposits of desirable iron ores below what had previously been considered a dike defining the depth of ore bodies. And later discoveries between the Gogebic and Eastern ranges have proven large quantities of iron ore. In Minnesota, which 30 years ago supplied no iron ore but has grown to be the largest known producer, ore is now obtained in sections which until lately were considered beyond the productive limits; while explorations are developing additional ore supplies. One hard-ore property, which had been a large producer but abandoned because of its apparent exhaustion, is still contributing to the ore supply and the deposit has been proven to extend into the adjoining properties, where it is successfully wrought.

The magnetic iron mines of the Lake Champlain district, which have long been active, show no signs of exhaustion and new explorations are exposing ore bodies, whose magnitudes have been estimated in hundreds of millions of tons. The Cornwall ore banks in Pennsylvania, which have been supplying ore for over 170 years, have lately been equipped on a scale demonstrating that the owners are satisfied of liberal reserves for many years to come. Active mining, which has been prosecuted for about 40 years in the Birmingham district in Alabama, does not suggest exhaustion, but rather directs attention to the probabilities of a liberal supply of ore for the future. Iron ores have been determined as existing in liberal amounts either by exploration or by more or less continued exploration in the eastern and central parts of the country, also in the Rocky mountain region and the territory to the west. In Colorado an important iron and steel industry has been maintained for more than three decades upon ores mined from deposits, some of which are of known magnitude in the Rocky mountain region.

The litigation between the national government and the United States Steel Corporation brought forth sworn testimony from experts, among which were the following estimates of iron ore reserves:

In Michigan: 170,000,000 long tons, or if high silica, low phosphorus ores of 40 per cent grade are included 219,000,000 long tons. Minnesota in 1911 was credited with 1,670,000,000 tons, the Cuyuna being then estimated at 40,000,000 tons and subsequently increased to 400,000,000 tons. The tonnage of reserves of the Great North-

(*Continued on page* 1060b)

A paper presented at the Pittsburgh meeting of American Institute of Mining Engineers, Oct. 9, 1914.

Tests of Engine of New Design

Interesting Results of Tests on New Engine Built by the Wm. Tod Company for the Brier Hill Steel Company

THE Brier Hill Steel Co., Youngstown, O., recently has completed and put in operation a new reversing mill and engine. The mill is of the most modern construction, while the engine is of a design new to American reversing mill practice. The engine and mill with the rest of the mill machinery of the new steel plant were designed and built by the William Tod Co., Youngstown, in co-operation with Julian Kennedy, consulting engineer for the Brier Hill Steel Co.

The 40-inch, two-high blooming mill is shown in Fig. 1. The engine is twin tandem compound having 44-inch high pressure, 76-inch low pressure cylinders, and 60-inch stroke. The compact construction of the engine is shown in Figs. 2 and 3. The low pressure cylinders are set side by side as closely as possible, with the high-pressure cylinders directly connected to the main frames. This construction, as well as the arrangement of steam chests and valves above the cylinders, is shown in Fig. 2. The very short double throw main shaft is of interest, in that it is reversible end for end, and with this construction, has but three bearings.

With a short shaft, the power impulses of the cranks are applied nearer the general center line of the engine. This arrangement reduces the horizontal leverage to which is applied the working action of the reciprocating parts. As a result, it is said, the wracking or twisting action is greatly reduced. This very rigid construction preserves the alignment, and thus keeps down the stresses.

The mill train is equipped with Tod double helical machined pinions and a Kennedy machined spindle. Backlash in the pinions is kept down to a minimum. It is stated by the builders that tests indicate that these pinions, when properly designed, cause a saving of 18 per cent of the power required to drive the mill.

Steam is applied at a pressure of 160 pounds with 35 degrees Fahr. superheat. The latter has no practical advantage in increased efficiency, but insures dry steam at the engine and removes the necessity for water drips and traps along the steam mains.

Another marked departure from previous reversing engines is the control mechanism. There are two interconnected levers which control the reversing gear and the high-pressure and low-pressure throttle valves. This system, it is stated, permits the operator nearly to dispense with the use of steam for plugging or stopping the engine after having rolled the piece.

There is one high-pressure throttle valve and two throttle valves, one on each low-pressure cylinder. The latter, clearly shown in Fig. 2, are between the receiver and the low-pressure steam chest. All throttle valves are said to be so completely under the control of the operator that he can shut off absolutely all working steam from all cylinders. The engine then has no power for further running, except the inertia in the moving parts. The operator is said to acquire readily the necessary experience and can shut off the steam at the proper instant to use the stored up inertia in clearing the piece from the pass.

The results of a recent test of this engine are shown in Figs. 4 and 5. Fifteen passes are used in rolling an 18 x 20-inch ingot to a 7 1/16 x 7¼-inch bloom. The later passes are a little more difficult to control as the small piece does not offer as much resistance per revolution as earlier.

Eight continuous indicator cards were taken simultaneously during the rolling of 20 ingots. All being practically alike, only the one set for pass No. 15 are shown in Fig. 4. The total mean effective pressure referred to one low-pressure cylinder for the same pass is shown in Fig. 5.

The number of revolutions required for rolling the ingot was 47 and the working revolutions were 36.7, leaving for idle and plugging revolutions, 10.3. This was an average of only two-thirds of a revolution per pass more than was necessary for the piece to clear the mill.

The ingot on which the Brier Hill test was made had been reheated and consequently was not sufficiently hot at the center. The co-efficient for this ingot, according to the Neeland-Gasche formula, was 17,300. The actual steam consumption as measured from the high-pressure card of the combined card, allowing 25 per cent condensation factor for working and plugging steam, was 462 pounds per gross ton of steel rolled.

This engine is proportioned for condensing but at present is exhausting to an open-feed water heater. It is customary

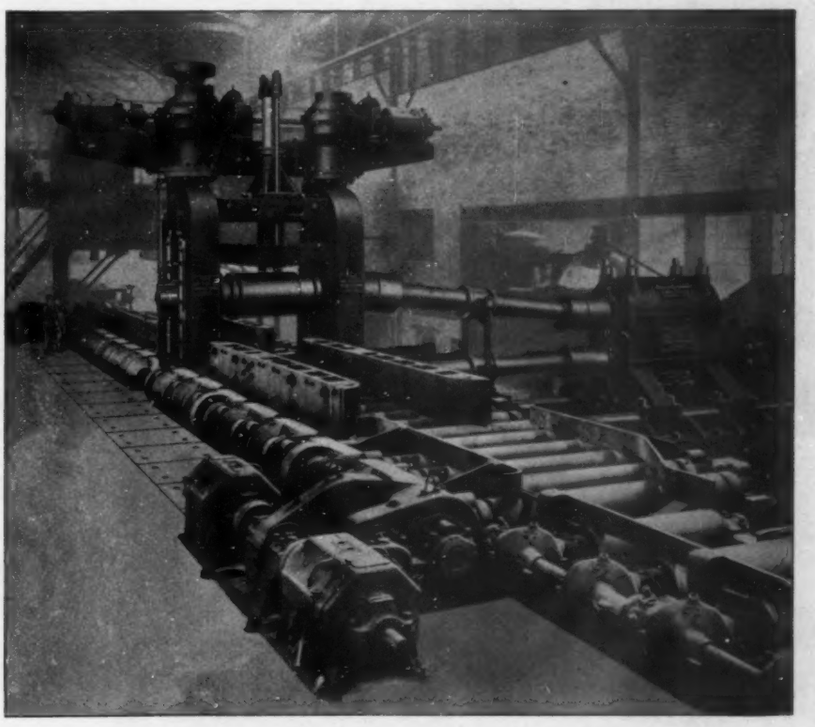


FIG. 1—NEW 40-INCH BLOOMING MILL IN BRIER HILL PLANT

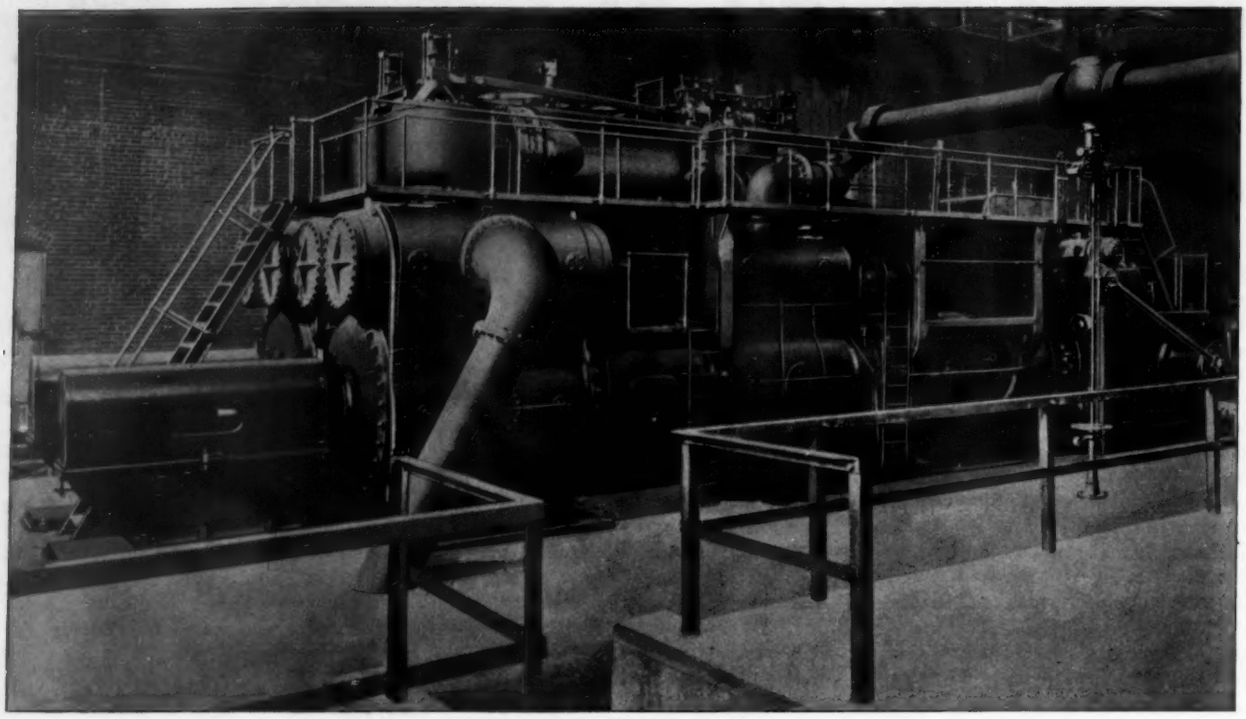


FIG. 2—VIEW SHOWING ARRANGEMENT OF STEAM CHESTS AND VALVES ABOVE THE CYLINDERS

to allow 25 per cent for the saving of condensing operation, but allowing only 20 per cent as the net saving, the engine rolled a gross ton of steel with 371 pounds of steam.

A thoroughly heated ingot has a coefficient of 13,000. The ratio of these numbers (C = 17,300 to C = 13,000) is the ratio of excess work done by the engine in rolling the colder ingot. Correcting for the temperature effect gives a steam consumption of 350 pounds of steam per gross ton of steel rolled, while an allowance for the probable saving due to condensing, indicates that the engine will roll a gross ton of steel with 280 pounds of steam.

This saving, it is stated by the builders, is due largely to the complete control of the engine and to the low

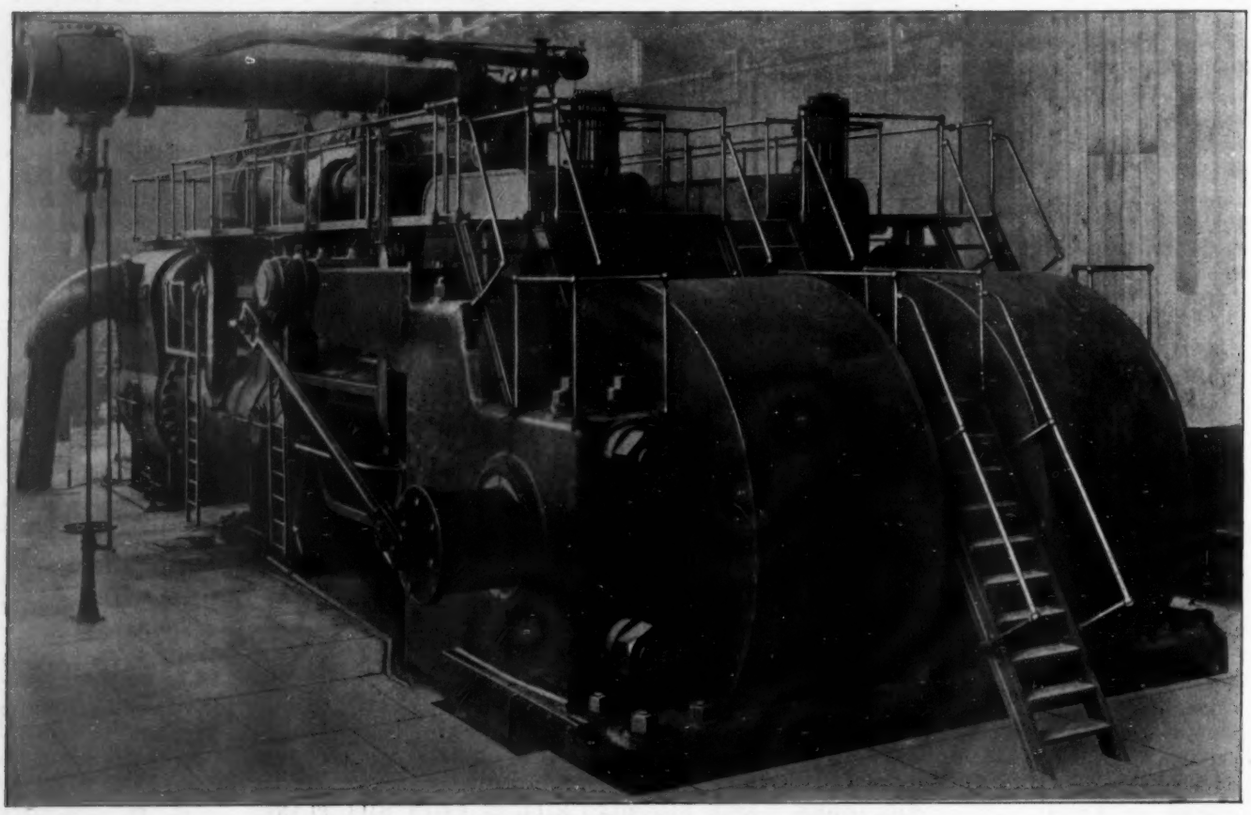


FIG. 3—NEW ENGINE BUILT BY THE WM. TOD CO.

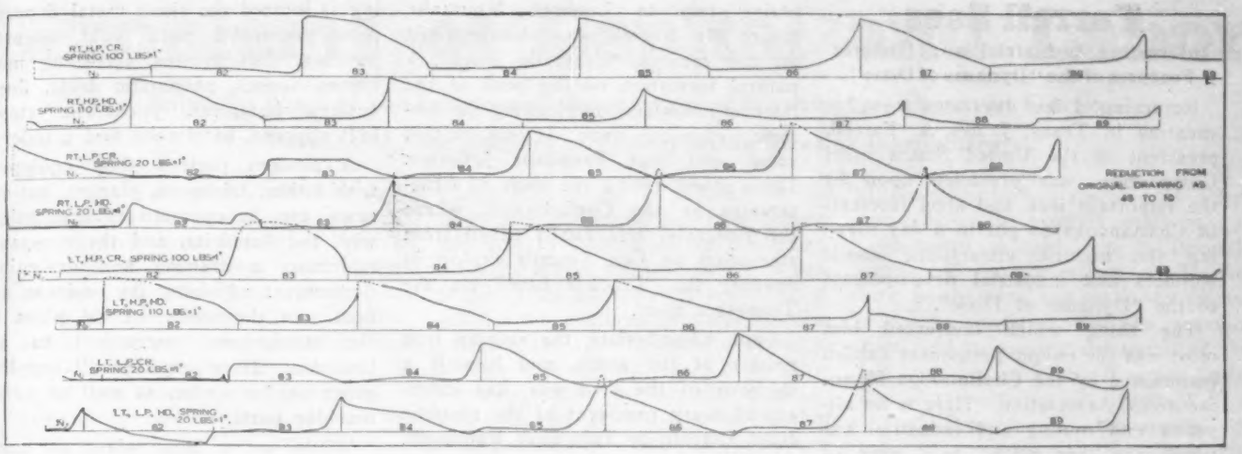


FIG. 4—INDICATOR CARDS TAKEN FOR PASS NO. 15

pressure throttle valves. The saving of the latter has proved to be cumulative.

The little time consumed in plugging gave more time for working without the necessity of high speeds. The average speed of this engine while rolling was only 70 revolutions per minute. The distribution of the work done in per cent of total work was as follows:

	Per cent.
Total work	100.0
Friction work	13.0
Acceleration or plugging work	13.6
Net work to rolling of steel	73.4

In a recent issue of the Proceedings of The Engineers' Society of Western Pennsylvania, another engine of an older type was reported as delivering 54 per cent to the piece, while 33 per cent was expended in acceleration.

Another advantage pointed out by the designers of this engine is that the low-pressure cylinder not having steam, relieves the plugging due to its own negative work. As an illustration, in a steam engine as ordinarily run, the working steam acts on one side of the piston and the exhaust steam acts oppositely on the other side. In this engine, it is stated, the throttle valve is closed so promptly that the card produced is a working card below the exhaust line instead of above. The effect of this is to help stop the engine instead of pushing it forward.

Large Orders Reported

The Concrete Steel Co., Youngstown, recently has taken a number of attractive orders for reinforcing steel, including 600 tons for the Ford Motor Co. building at Cleveland; 300 tons for a building for the Columbus Athletic Club, Columbus, O.; 200 tons for a hotel at Miami, O.; 300 tons for a school building at Lorain, O.; 175 tons for a high school building at Hot Springs, Ark.; 100 tons for a bridge at Everett, Mass.; 200 tons for a disposal plant at Sandusky, O.; 100 tons for a retaining wall at Massillon, O.; 100 tons for the Independent Telephone Co. building at Grand Rapids, Mich.; 100 tons for the Kimball department store at Milwaukee, and several contracts for buildings involving less than 100 tons.

Work on No. 2 stack of the Andrews & Hitchcock Iron Co., Youngstown, at Hubbard, O., which is being rebuilt, is progressing rapidly. The furnace will have a daily capacity of 500 tons when completed.

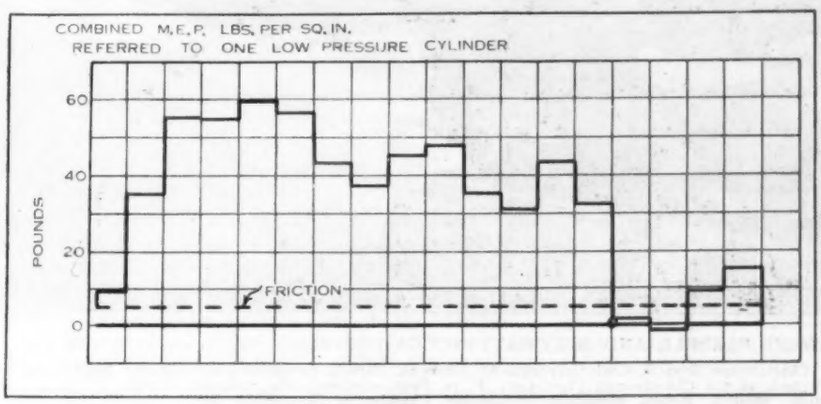


FIG. 5—TOTAL MEAN EFFECTIVE PRESSURE REFERRED TO ONE LOW PRESSURE CYLINDER FOR PASS NO. 15

Titanium Steel Converter Tops

The Prime Steel Co., Milwaukee, recently has completed an order for a number of Bessemer converter tops of unusually thin section considering the size and weight of the castings. Each casting is solid steel, weighing 15,000 pounds, 13 feet in diameter at the bottom and 6 feet high, with a flange 1½ inches thick around the lower edge, the walls being 1⅛ inches thick. The castings have the characteristic shape of the top of a Bessemer converter, namely that of a truncated eccentric cone. The pattern was of skeleton form and the castings were made in a 14-foot concrete-lined pit. Although the thickness called for was 1⅛ inches, it was decided to use a pattern thickness of 1 inch throughout to allow for the deformation resulting from cooling strains. The calculations proved correct as the measurements were true throughout the shell. One central gate and eight runners were used, making a complete distribution of steel throughout the surface of the shell. Titanium alloys were used in the steel, eight pounds to the ton being introduced in the ladle.

Orders for Shrapnel

The *Sheffield Telegram*, Sheffield, Eng., says:

"Orders have been placed by the British Government in Canada for shrapnel shell to the value of over $2,000,000, and these orders will in all probability be supplemented from time to time as circumstances demand. These shells are being forged under new hydraulic forging presses, which are equal in power and efficiency to any on the American Continent or in Europe, and the Canadian plants are fully equipped to produce any class of shells."

Farrell Sees

Interesting Industrial and Historic Features of the "Dynamo of Dixie"

Returning, a few days ago, from his vacation in Texas, James A. Farrell, president of the United States Steel Corporation, was prevailed upon by the important iron and steel interests of Chattanooga to put in a day viewing the historic attractions, scenic wonders and industrial developments of the "Dynamo of Dixie".

The thing which impressed him most was the unique permanent exhibit maintained by the Chattanooga Manufacturers' Association. Here is an all-year-round mining and industrial exposition, a "live index", as it were, of the 1,137 articles manufactured in the nearly 300 factories of the Chattanooga district.

After inspecting various industrial plants, Mr. Farrell was entertained at lunch by former United States Senator Newell Sanders, owner of the Newell Sanders Plow Co., and resident director of the Nashville, Chattanooga & St. Louis railroad, the guests including Mrs. Farrell, Miss Farrell, F. A. Burr, southern sales manager of the Steel Corporation; Paul J. Kruesi, president of the Chattanooga Chamber of Commerce; C. E. Buek, president of the Chattanooga Iron & Coal Corporation, and Capt. H. S. Chamberlain, president of the Citico Furnace Co. and the Roane Iron Co.

The afternoon was spent in a sight-seeing trip to Lookout Mountain, where Mr. Farrell was photographed on the famous "Umbrella Rock", a natural formation on the peak of the historic mountain, overlooking the historic Tennessee river. It was on this same spot that President Jefferson Davis stood during the siege of Chattanooga by the Confederates, where the Federals were finally saved from starvation by Gen. Grant's exploit in opening the "Cracker Line" via the Tennessee river.

Capt. Chamberlain, the veteran iron master of the south, and himself a survivor of the civil war, has entertained every president of the republic from Lincoln to Taft, save Roosevelt, on this same spot.

Seattle Electric Steel Foundry

(*Continued from page* 1045.)

126-inch and one 68-inch Chester-Albre pneumatic gap riveter, one 144-inch electric-driven Wickes Brothers plate bending roll made by the Lennox Machine Co., one set of rotary bevel shears, Lennox rotary splitting shears for ¾-inch material, Lennox rotary splitting shears for ¼-inch material, a Cleveland Punch & Shear Works heavy vertical punch, and a Hilles & Jones heavy horizontal punch. The rivets are heated by gas from the city mains. On the balcony floors and in the wings of the building is located the sheet metal department, equipped with light shears, punches, drill presses, threading machines, forges, pneumatic drills, flue-cutters, hammers, pneumatic stay-bolt clippers, hand rolls and grinders.

A modern pattern shop equipped with lathes, trimmers, planers, cut-off saws, etc., is operated in connection with the foundries, and the company maintains a drafting and designing department adjoining its business offices. In the center of the plant is the stock-room, convenient to all branches. Here are kept all supplies given out on order, as well as extra machine parts.

While not a large plant as compared with some in the east, the Washington Iron Works is one of the few on the Pacific coast which manufactures its product complete from the raw material. Specializing as it does in two more or less similar lines, the firm has reached a high state of efficiency. President J. M. Frink, who is president also of Seattle's park board, had never but once been inside a foundry before he embarked in this business.

Will Not Retire.—The Best Mfg. Co., Pittsburgh, states that the rumors that it intends to retire from the piping business are entirely without foundation. It will continue in the business, in which it has been engaged for over 30 years.

PRESIDENT FARRELL AND HIS CHATTANOOGA HOSTS

Left to right: C. E. Buek, president Chattanooga Iron & Coal Corporation; James A. Farrell, president United States Steel Corporation; Capt. C. D. Mitchell, of the Chattanooga Plow Co.; F. A. Burr, southern sales manager of the United States Corporation; Paul K. Kruesi, president Chattanooga Chamber of Commerce. Below, Capt. H. S. Chamberlain, president Roane Iron Co. and Citico Furnace Co.

Problems of Capital and Labor

Splendid Work of the Employers' Association of Washington Shown in Election Results—Labor Leaders of Pennsylvania Meet at Harrisburg

Seattle, Nov. 28.—There has been little stir in labor matters since election when radical legislation received a check all along the coast. There are no strikes and no evidence that there is to be any trouble soon. The defeat of the universal eight-hour law and other initiative measures having to do with labor may be attributed in a great measure to the employers' associations which have carried on a vigorous educational campaign against the proposed laws. The Employers' Association of Washington, to which a majority of the employers in the state belong, has been particularly active in this regard. It has not only been active, but owing to the ability and determination of the men conducting its affairs, it has nipped many a strike in the bud and has a decidedly deterrent effect upon those who would otherwise be inclined to stir up strife.

Notwithstanding the fact that the American Federation of Labor at its recent convention in Philadelphia failed to endorse universal eight-hour legislation, the fight is to be kept up as far as Washington is concerned at least. The effort will probably not be crowned with success as long as the Employers' Association of Washington holds the high rank it has attained as an educator. It will also be hard to overcome the handicap occasioned by the failure of the American Federation of Labor to endorse the proposition.

The initiative measure providing for first aid to the injured, which was defeated by a narrow margin at the recent election in Washington, is to be the bone of further contention. Acting under instruction of the executive board of the Washington State Federation of Labor, E. P. Marsh, president of the state federation, and Martin J. Flyzik, president of district No. 10 of the United Mine Workers, have declined to accept the appointments tendered them by Governor Lister as members of the commission selected to draft a "first aid" amendment to the present workmen's compensation law. The reason given for the refusal is that labor stands committed to the theory that industry should bear the cost of accident. The measure defeated at the recent election exempted the laborer from bearing any portion of the burden.

Private employment agencies were voted out of existence at the last election in Washington and Labor Commissioner E. W. Olson in his forthcoming biennial report is recommending to the legislature the enactment of a law to provide for a system of state employment agencies. A bill has not yet been prepared for this purpose, the commissioned desiring to consult with the managers of employment agencies in Seattle, Spokane and other points, before going further into the matter. Among the recommendations contained in the report are: State aid for workmen in collecting their wages; better legislation relative to collecting data concerning employment; that in case of strike both sides be compelled to submit sworn statements relative to the points in controversy; broadening of the eight-hour public works law so as to eliminate its present ambiguity in a number of particulars, one of the amendments suggested being to the effect that resident laborers be given preference on all public work done in the different counties or municipalities in the state.

The Hatters' Case

Washington, Dec. 1.—Briefs were filed last week by counsel for D. E. Loewe & Co., the Danbury, Conn., hat makers awarded $252,000 damages under the Sherman law against 182 members of the United Hatters' Union for injuries from a boycott, asking the Supreme Court of the United States to affirm the judgment of the lower court. The briefs argue that conditions surrounding the organization of a modern labor union call for the application of the rule making members of an association liable for the acts of their officers.

Labor Leaders Meet

Representatives of organized labor in Pennsylvania will put their ideas on legislation into form at the biennial meeting of the legislative committee of the Pennsylvania Federation of Labor which will assemble at Harrisburg, Dec. 8, for a session lasting three days. Every branch of organized labor is represented on this committee and the leaders have invited Dr. John Price Jackson, commissioner of labor and industry, to address them in regard to labor laws, sanitation and employment bureaus. Considerable will be said at the meetings about the proposed workmen's compensation act on which many of the labor leaders are said to differ, especially on the form of insurance.

Organized railroad men in Pennsylvania will have meetings at Harrisburg in the next few weeks to discuss proposed legislation and to organize their fight to prevent the repeal of the full crew law of 1913. It is the intention of railroads to ask its repeal.

The Pennsylvania Department of Labor has issued its first industrial directory, giving names and addresses and lines of over 25,000 concerns, including the names, addresses of officers and other facts about organizations of manufacturers, employers, labor unions and various employes' associations.

Proposed Legislation

Harrisburg, Pa., Dec. 1.—Pennsylvania's general assembly, which will convene the first Tuesday of January, will not stay in session longer than 100 days and from present indications there will be a legislative program mapped out for it and much of the confusion attending the organization of the last legislature, with committees on committees and other changes from long established custom, will be avoided.

Present indications are that the following legislation will be enacted:

Workmen's compensation.
Changes in minor labor hours.
State building code.
Regulations for operation of oil wells and quarries.
Encouragement of industrial schools.
Additional water conservation laws.
Encouragement of small farms near industrial centers.
Enlargement of state control of housing.
Introduction of economy and efficiency in state government.

Indications are that the effort to abolish the state police will be decisively defeated and the effort to raise revenue by a five mill tax on capital stock of manufacturing corporations will probably be beaten again.

Increased Activity. — On account of improved business in gas engines for farm and general utility purposes, the gas engine shop of the Eclipse works of Fairbanks, Morse & Co., at Beloit, Wis., has been placed on a 40-hour per week working schedule, after running 32 hours per week for some time.

Business News from the Capital

Not Many Important Measures in Addition to the Appropriation Bills to be Considered at the Short Session of Congress

Washington, Dec. 1.—With 14 appropriation bills before it for enactment at the short session to begin next Monday, Congress is not expected to pass much legislation in addition to those measures.

President Wilson has pointed out that, inasmuch as the session expires by constitutional limitation on March 4, next, it would be impracticable to attempt passing any great measure, and moreover, has intimated that he proposes to give business a rest for the next two years. His so-called business program was apparently considered complete with the adjournment of Congress of Oct. 24. The tariff, currency, and anti-trust bills constituted this program. The Rayburn securities bill, once included in the anti-trust legislation, has been abandoned entirely. It was proposed by this measure to give the Interstate Commerce Commission control of the issuance of stocks and bonds by the railroads.

The President is holding conferences with leaders of Congress preparatory to the opening of the session next Monday with relation to the legislative program. It seems evident that certain measures have been selected for enactment, if possible, after the appropriation bills are out of the way. It is known to be the desire of the President that the so-called conservation bills be passed. They have passed the House and are now pending before the Senate. Included in the list are the water power and general dam measures. It is also hoped to enact a bill providing for enlarged homesteads, so strongly supported by western delegates to Congress.

The seaman's bill promises to remain where it now is, before the Commerce Committee of the Senate. A sub-committee of the general committee, it will be recalled, has recommended that the bill be sent to conference. Strong opposition made to it by vessel owners, backed by sound arguments, prevented precipitate action on it, and, when finally passed, it is believed it will be of much less radical nature than it was when it passed the Senate of the present Congress. It was modified considerably by the House and deprived of some of its stringent features, but is not yet acceptable to vesselmen, and, indeed, the seaman's union is not satisfied with it.

It is not believed that the ship purchase bill will come up, although it is on the House calendar. But if it is taken up, it seems certain that it will be so amended as to at least take away the government control idea. The more thought there is given to the question the stronger becomes the opinion, it seems, that to establish a real American merchant marine, it is necessary to revise the navigation laws so as to place shipowners of this country on a competitive basis with owners of foreign lines. It is reported that the President in his address to Congress will make reference to the ship purchase bill, but will not urge the enactment of such a measure at the forthcoming session.

A measure in which vital interest is exhibited by employers and employes alike and favored by them is a bill to create a bureau of labor safety. This is pending before the Senate now. It lay for months in a pigeon hole of the Committee on Education and Labor, of which Senator Hoke Smith, of Georgia, is chairman. Senator Smith finally referred it to a sub-committee, which continued to allow it to lie without action. Finally Senator Shively, of Indiana, a member of the general committee, succeeded in getting it on the calendar. Whether it will get attention at the short session is a question. It has passed the House. Two other bills pending before the Senate, which are of special interest to the business world, include one to prohibit the importation of prison-made goods and another to limit the hours of railroad employes.

Would Amend the Sherman Law

Washington, Dec. 1.—A greater degree of co-operation in the conduct and for the protection of the foreign trade of the United States than is now possible under the Sherman law will be sought through additional trust legislation at the forthcoming short session of congress.

The trust committee of the Chamber of Commerce of the United States, with headquarters in this city, which today began a series of hearings in New York, proposes to recommend to congress the passage of an amendment to the Sherman law considered especially advisable as a result of the war to aid foreign trade of this country. A large majority of boards of trade, chambers of commerce and other commercial and financial organizations of the country associated with the National Chamber of Commerce are supporting the proposed legislation.

It was through the suggestion of the Chamber of Commerce of the United States that a clause was incorporated in the Federal Trade Commission law, soon to become operative, for inquiry into combinations in trade abroad with which American exporters are compelled to compete. The commission is instructed to make recommendations to congress for a suitable amendment to the Sherman law so as to permit American exporters to form combinations and use common agencies only to such an extent as to put them on a business level with competitors in foreign countries.

Difficulty is being experienced by some American manufacturers in securing South American trade because of the combinations in trade among European and other foreign competitors. It has been found by some manufacturers of this country that profits in certain lines of South American trade are insufficient to justify the expense of each of them sending a representative, who is equipped with a knowledge of Spanish, for instance, or, in the case of Brazil, with a knowledge of Portuguese, the language used there, and one who is of the high class type of urbane man necessary in South America to obtain satisfactory results.

This being the case some manufacturers desire that the Sherman act be so amended that it will be possible for all manufacturers in single lines to unite in employing one or several salesmen.

It was following the last annual meeting of the organization that a trust committee was appointed to look into these questions and a plan of campaign will be determined upon at the New York hearings which began today. The hearings are to be held in the rooms of the Merchants' Association, in the Woolworth building.

The trust committee is comprised of the following members:

R. G. Rhett, banker, Charlestown, S. C.; Charles F. Mathewson, attorney, New York City; W. L. Saunders, Ingersoll-Rand Co., New York City; Prof. Henry R. Seager, economist, Columbia University; Guy E. Tripp, chairman executive committee, West-

inghouse Electric Co., and Dr. Charles R. VanHise, president University of Wisconsin.

It was stated at headquarters of the United States Chamber of Commerce that the committee may urge President Wilson to appoint the members of the Federal Trade Commission as early as possible, in view of the many questions which are to come before it. It was said that even if the committee does not make that request upon the president a discussion of the subject will almost certainly take place. The president is known to be considering names for the commission and has said he hopes to send the nomination to the senate this month. The committee may content itself with merely framing a recommendation to congress for a suitable amendment to the Sherman law, hoping to have it ready almost as soon as congress re-convenes. Should the conclusions of the chamber's directors be general, they may be submitted by a referendum vote to the entire membership of the chamber. Usually 45 days' time is required to complete this process.

German Trade During War Times

Manufacturers Contend With Unusual Difficulties—Limited Activity for Near Future Probable

Amsterdam, Nov. 7.—Correspondence reaching this city from various sources with regard to the German iron trade indicates that after the first shock, following the commencement of hostilities, which was felt in every branch of the iron trade, united efforts were made to cope with the new conditions and as far as possible to "keep things going." The resumption of railway traffic made possible the transport of coal and coke to the Lorraine and Luxemburg works and the conveyance thence of ore to the Rhenish-Westphalian districts. The importance of maintaining regular rail communication was emphasized very strongly and it is evident the military requirements in respect to the railways had a completely paralyzing effect upon the industry during the first few weeks of the war. A period of very limited activity is indicated for the immediate future, and many difficulties and complications appear to have arisen in regard to the fulfillment of orders and contracts arranged prior to the war. A continued shortage of ore is regarded as highly probable, and apprehension is expressed as to the possibility of maintaining even the minimum supply necessary to keep the works going. The Rhenish-Westphalian works seem to be the best off in this respect, some of them having ore supplies sufficient to carry them over several months. The seizure of stocks of manganese ore lying at Belgian and French works has to some extent relieved shortage in other directions, but it is significant that the price of foreign ore has gone up to twice its normal figure. This fact, in conjuction with the increased cost of fuel and limitation of output, brought about a higher price scale, puddled iron being fixed at $16.68½, steel iron at $17.39—$17.62½, spiegeleisen at $19.74, and hematite at $19.50½, etc. Work in connection with army and navy contracts is said to have compensated to a great extent for the loss of business through the usual trade channels.

The market in half manufactured material suffered severely owing to lack of export business, and manufacturers were compelled to limit themselves to the execution of existing orders. An increase in price amounting to $1.76¼ was decided upon by the manufacturers. In the bar iron market, also, much trouble was occasioned by disputes in connection with contracts fixed at low prices before the outbreak of war, and many works were unable to make deliveries at all owing to difficulties in organization. New business is almost non-existent and there is lack of unanimity in regard to prices, but higher figures are asked for all classes of material. It is admitted that prospects of future business at home—to say nothing of export orders, which have ceased entirely—depend entirely upon the course taken by the war. The sheet-iron industry has also suffered severely, though some foreign orders have been received subsequently to the removal of the export prohibition. It has been found necessary to demand higher prices in this branch also. Army contracts have provided a certain amount of work, but it is mentioned that orders for the mercantile marine are almost completely lacking. Wire manufacturers are stated to be idle with the exception of those producing galvanized and barbed wire, who have done plenty of profitable business. In regard to export business some orders have been received, but these can only be accepted at increased prices. It is pointed out by one German correspondent that the extinction of Belgian competition will have a stimulating effect upon this business. Heavy railway material has been in good demand in consequence of government orders, but complaint is made that municipal authorities have kept back their contracts.

Russian Trade

Paralyzing Effects of War on Some Kinds of Production

Petrograd, Nov. 3.—The tone of the Russian iron trade as reported from Kharkoff is remarkably strong, and the tendency upwards is well maintained. Merchant iron is quoted 1 rouble 63 to 68 copecks (82½ to 85 cents) per pood (36 pounds); girder iron 1 rouble 58 to 63 copecks (80 to 82½ cents); tank iron 1 rouble 85 copecks (93½ cents); roofing iron 2 roubles 20 to 25 copecks ($1.12 to $1.14½). In each of the foregoing cases there is a marked advance in price compared with the prices ruling a month before. Pig iron is quoted 73 to 74 copecks (36½ to 37 cents) per pood and foundry iron 68 copecks (34 cents) per pood.

The paralyzing effect of the war on some branches of the iron industry will be seen from the statement just issued of the orders received by the Prodameta. The Russian iron syndicate, during the month of September, making only 2,813,110 poods (45,372 tons) against 10,281,212 poods (165,826 tons) in 1913 corresponding month. The decline affects all the items named in the list, namely sheet iron, girders and sleepers, merchant iron, tires and axles and rails. This last named at all events indicates the withdrawal of the government from its active railway policy of the past few years, under stress of the military situation.

Advices from Moscow say that the war has not affected the position for black roofing iron which is being produced full swing at the Ural works nor is there any shortage of labor experienced.

TIPS FOR NEW BUSINESS

Equipment needs of the Iron and Steel works, Machine shops, Foundries and other Metal Working plants

INTEREST in the eastern machine tool market continues to focus around the concerns who have booked contracts to manufacture shrapnel and other munitions of war for the belligerent countries in Europe. The Bethlehem Steel Co., which is preparing to go into the manufacture of shrapnel on an extensive scale, and which was mentioned in last week's issue of THE IRON TRADE REVIEW as having purchased some $200,000 worth of machine tool equipment, is expected to close very shortly on some $200,000 to $300,000 worth of additional machinery; all of this equipment is to be used in the manufacture of shrapnel and field guns. The Baldwin Locomotive Works, which was reported as figuring on a shrapnel contract, is asking for bids on a large quantity of machinery such as is used for making shrapnel. The Taylor-Wharton Iron & Steel Co. is reported as figuring on a shrapnel contract, while the Tindel-Morris Co., Eddystone, Pa., finally has decided to take up the manufacture of this material. The placing of fire arm and munition contracts from abroad is responsible for the activity of a good many manufacturers who are making extensions to their plants. Practically all the arms makers have made or are planning to make enlargements in their capacity. Thus, the war in Europe continues a boon to a good many manufacturers in this country, especially such as are large users of machine tools. While orders have been placed during the past week for machine tools for export, these were not large in the aggregate, so that the direct machine tool demand from abroad is not nearly as active as a month or six weeks ago. New York machinery houses report a fair demand for second-hand equipment during the week; there is more of this second-hand equipment on the market at present than usual. There is a scarcity of large lists, the only important ones which now are current, being those referred to above. There is no activity on the part of the railroads and a machinery salesman who recently has canvassed all the eastern roads reports that there is no likelihood of sizeable buying by these interests before next spring. The government is one of the large prospective buyers at present. The navy department has asked for quotations on a large amount of machinery, bids to go in about the middle of this month. The navy department also will open bids this month for three cranes for Pearl Harbor, Hawaii. A purchaser of cranes last week was the Southern Power Co., which bought three cranes for installation in a plant in North Carolina. The American Iron & Steel Mfg. Co., Lebanon, Pa., is in the market for a 15-ton telescoping crane. The Electro Dynamic Co., Bayonne, N. J., made some fair machine tool purchases last week. Eastern dealers continue to report a fair volume of small orders and it appears there has been no reaction from the improvement noted during the past few weeks.

Marked improvement in sentiment in Pittsburgh and adjacent territory, has lead machine tool dealers there to believe equipment buying soon will be more active. Prospective buyers, it is reported, are in a much more receptive mood than previously and it is not improbable that some of the negotiations which have been pending several months will be closed shortly. Scattering inquiries for miscellaneous lines have come out, but sellers of machine tools are more directly interested in requirements for new shops. Demand for tools and machinery for foreign shipment indirectly is benefiting the trade in that city.

Machine tool dealers in Chicago are taking encouragement from an increased inquiry and from the general tone of the market. Buying has not been much livelier, but indications are thought to point to better conditions in a short time. One dealer, who specializes somewhat in railroad shop trade, made a thorough canvass the past week and states that lists are being prepared for submission within a short time. The Santa Fe railroad is seeking a heavy car wheel lathe, which probably will be furnished by a Cincinnati builder. On account of heavy foreign buying from manufacturers in other centers, various lines of lathes and other tools have been practically sold out and buyers desiring to obtain such tools are being informed that delivery will be considerably deferred. This is having the effect of throwing some business to dealers who have such machines on their floors. Builders of machine tools in Milwaukee and other cities in that vicinity are busy on shipments for foreign countries and most of them have sufficient orders on their books to keep them busy for several months. Buyers for foreign governments are frequent visitors and additional business of this sort is being taken constantly.

In Cincinnati, the demand for machine tools from foreign countries is confined largely to lathes. Orders for planers have come in recently, to the surprise of the local market, as it was thought very few planers would be needed. Radial drills also have been selling well, and all plants in that city making lathes, radial drills and planers are running full force. Several plants making lathes are running night shifts. Jobbing foundries are operating heavier than for a long time, their work being confined mostly to making castings for machine tool builders.

Is Your Shop Immune?

Are You Suffering from

Shop Flooring Disease?

Altho it is not commonly recognized as a disease, nevertheless there IS a disease prevalent among shops and foundries that should be known as "FLOORING DISEASE".

This disease, if allowed to run its course, proves fatal. Nor is it confined to one locality. It begins in many places and spreads in every direction until it reaches the farthest corners. It plays havoc not only with your floor, but with your whole shop. Its ill effects work into the various vital parts of your organization by causing DELAYS, EXPENSES and ACCIDENTS, until your whole plant is in a sadly run down condition.

Why not install a flooring that is immune from disease? A flooring that is *wearproof, dustless, sanitary* and *silent!*

"FLOORS", a little free booklet issued by us will convince you of the invaluable qualities of AYER & LORD INTERIOR WOOD BLOCKS.

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CLEVELAND, O.—801 Swetland Bldg. ST. LOUIS, MO.—554 Pierce Bldg.
KANSAS CITY, MO.—1117 Rialto Bldg. MEMPHIS, TENN.—1402 Exchange Bldg.
PHILADELPHIA, PA.—319 Perry Bldg.

The illustration shows an installation of Ayer & Lord Interior Wood Blocks in a sheet metal stamping works.

This flooring, although having to undergo severe usage, shows no deterioration whatever.

AYER & LORD INTERIOR Always Easy on the Feet WOOD BLOCKS

Say you saw it in THE IRON TRADE REVIEW

EASTERN STATES

ELLSWORTH, ME.—Lumber mills of C. J. Treworgy & Co. and Whitcomb, Haynes & Co. were burned; estimated loss $20,000; mills will be probably rebuilt at once.

BARNSTABLE, MASS.—J. W. Bishop Co. has the contract for the freezing plant to be erected by Alfred Crocker, M. H. Harris and E. S. Ellis.

BOSTON.—A. Diamond has been granted a permit for erecting a light manufacturing building at 5 Hudson street.

BOSTON.—Henshay Motor Co. has been incorporated; $25,000 capital stock; by Charles S. Henshaw, Harry I. A. Hodgdon, Edward Henshaw.

CHELSEA, MASS.—A. G. Walton & Co., shoe manufacturers, are building a two-story, 80 x 100-foot addition to be ready about Jan. 1.

EVERETT, MASS.—Mitchell Shulkin, Dorchester, is building a one-story, 40 x 80-foot plant here, to be occupied by the Miller Architectural Iron Works.

HYDE PARK, MASS. — Atlantic Rubber Co., 1566 River street, is building a two-story and basement, 59 x 98-foot rubber cloth factory.

SALEM, MASS.—Naumkeag Steam Cotton Co. will build a one-story and basement, 55 x 121-foot boiler house.

BRIDGEPORT, CONN.—Royal Equipment Co., Bostwick street and Railroad avenue, manufacturer of automobile brakes and accessories, will build an addition, three stories, 80 x 100 feet; Kendall, Taylor & Co., 93 Federal street, Boston, are drawing the plans.

NEW HAVEN, CONN.—Winchester Repeating Arms Co. has been granted a permit to erect buildings, the estimated cost of which totals $95,200; buildings to be erected at once includes a one-story, 53 x 208-foot fireproof drop forge shop; a $21,000, 52 x 161-foot, fireproof hydraulic press building; $24,000, 52 x 201-foot, a building for the bluing department, part to be two stories and part one story, and an addition to the heating department, the company also is having plans drawn for a $100,000 shot tower.

NEW LONDON, CONN. — New London Ship & Engine Co. has let contracts for the erection of additional machine shops, 46 x 120 feet; work on this is to be rushed.

BROOKLYN, N. Y.—E. T. Trotter & Co., manufacturers of insulations, 602 Johnson avenue, are building an addition.

BROOKLYN, N. Y.—Gutta Percha Rubber Co., 53 Franklin avenue, will build an addition.

BROOKLYN, N. Y.—The plant and patterns of Pitz & Weber Iron Foundry, Inc., 283-289 Scholes street, recently were damaged by fire.

BROOKLYN, N. Y.—E. W. Bliss Co., which recently bought a large amount of new machinery, is having plans drawn for a one-story, 100 x 200-foot machine shop.

BROOKLYN, N. Y.—J. Sklar Mfg. Co., 133 Floyd street, is taking sub-bids on a four-story, 66 x 113-foot addition, to be used for manufacturing surgical instruments.

BROOKLYN, N. Y.—Brooklyn Rapid Transit Co. has let the contract for a sub-station extension at New Utrecht avenue and Sixty-Third street.

BROOKLYN, N. Y.—Kampfe Bros., 8 Reade street, New York, have let contracts for construction of two-story and basement, 90 x 120-foot safety razor factory at Atlantic avenue and Logan street here.

BUFFALO, N. Y. — Robertson-Cataract Electric Co. has let the contract for a four-story, 40 x 115-foot factory building at South Elmwood avenue and West Mohawk street.

ILION, N. Y.—Remington Arms Co., which recently bought 15 milling machines, 15 to 20 drill presses and considerable other machinery, has let contract for construction of a large addition.

MORRIS HEIGHTS, N. Y. — New York Yacht, Launch & Engine Co. has let the contract for a one-story manufacturing building, 50 x 105 feet, with 50 x 30-foot wing, to replace plant recently burned.

NEWBURGH, N. Y.—Stroock Plush Works is building a three-story addition.

NEW YORK.—New York Edison Co. has let contract for construction of a power station on West Farms road.

NEW YORK.—Herpace Paper Mfg. Co. has been incorporated; $30,000 capital stock; by J. J. McHugh, Henry and Abram Liedeker, 50 Broadway.

NEW YORK.—Chas. Cory & Son, 288 Spring street, manufacturers of fire bells, signal devices, etc., have under way a six-story factory, 75 x 90 x 30 feet, at 290 Hudson street.

NEW YORK.—Engineering Products Corporation, machinery, foundry, realty, has received its charter; $12 000 capital stock; F. H. Parcells, R. G. Redlefsen, G. Tiernan, 50 Wall street; incorporators.

PORT CHESTER, N. Y.—Work has been started on the addition to the plant of the Ernest Simon's Mfg. Co., shirt manufacturers.

YONKERS, N. Y. — Architect A. Van Suetendael, 15 North Broadway, is drawing plans for a two-story factory, 50 x 60 feet, name of the owner withheld.

ALLENTOWN, PA.—Easton capitalists have purchased a site in Bangor, Pa., and work has been started on a $25,000 factory; J. L. Morris, Easton, is superintendent; Robert H. Steinmetz, Bangor, president.

HARRISBURG, PA.—Johnstone Telephone Co. has increased its capital from $700,000 to $800,000.

LEBANON, PA.—American Iron & Steel Mfg. Co. is in the market for a 15-ton telescoping crane.

PHILADELPHIA. — Plans are being prepared for a power house for the home for feeble minded at Byberry.

PHILADELPHIA. — Baldwin Locomotive Works, which has been figuring on a shrapnel contract, has asked for bids on an extensive list of machine tools.

PHILADELPHIA, PA. — Jennie Fryman, 168 North Twenty-second street, has let contract for construction of garage and machine shop, two stories, 51 x 86 feet.

PHILADELPHIA.—George & Borst are taking estimates for the Atwater Kent Mfg. Co.'s one-story, 120 x 120-foot, factory building, to be erected at 4937 Stenton avenue.

PHILADELPHIA. — Philadelphia Electric Co. has let contracts for two-story and basement power house at Twenty-sixth and Christian streets.

PITTSBURGH.—H. E. Goss Co. will erect a $20,000, five-story factory building.

WILKESBARRE, PA.—Studevant & Poggi, architects, have plans for a $75 000 Masonic Temple to be erected in this city.

WILLIAMSPORT, PA.—Williamsport Radiator Co. will build a two-story, 48 x 50-foot pattern and storage building.

WILLIAMSPORT, PA.—National Silk Dyeing Co. is taking sub-bids on a two-story, 30 x 50-foot machine shop.

CAMDEN, N. J.—Victor Talking Machine Co. is taking bids on the construction of a power house, 75 x 150 feet, one story.

HIGH BRIDGE, N. J. — Taylor-Wharton Iron & Steel Co. is reported to be figuring on a shrapnel contract.

NEWARK, N. J.—Atlas Refinery Co. is making extensions, including erection of a cold storage plant.

NEWARK, N. J.—Salmon Heater & Construction Co., Inc., heater and boiler, has been incorporated; $125,000 capital stock; by Ralph B. Schmidt Jr., John M. Kitchell, James F. Farrell.

NEW BRUNSWICK, N. J. — Endurance Rubber Co. has let the contract for a one-story, 80 x 250-foot factory.

TRENTON, N. J.—Bergdoll Automobile Co., Philadelphia, will erect a large manufacturing plant at Trenton Junction, near here.

TRENTON, N. J.—City commissioners are considering the erection of a municipal lighting plant; Mayor Donnelly has moved for the proposed plant to be run by water from the water power stream now little used; matter will be brought up for final action in a few weeks.

BALTIMORE, MD.—Louis Levi, Real Estate Trust building, Philadelphia, is drawing plans for five-story and basement, 69 x 157-foot factory to be erected in Baltimore for United States Woolen Mills.

WASHINGTON, D. C.—Bureau of yards and docks, navy department, will open bids some time in December for three cranes for Pearl Harbor, Hawaii.

WASHINGTON, D. C.—Bureau of light houses will receive bids until Dec. 10 for cast iron, bronze metal work, etc., for the St. Elias light station, Alaska.

WASHINGTON, D. C.—Bureau of yards and docks, navy department will take bids some time after Jan. 1 for the erection of a $400,000 power plant at Indian Head, Md.

WASHINGTON, D. C.—Bids will be received until 11 a. m., Dec. 12 at the navy department, bureau of yards and docks, for furnishing nine steel tanks of 2,100 000 gallons capacity each for storage of fuel oil.

WASHINGTON, D. C.—Bureau of supplies and accounts, navy department, will receive bids until Dec. 15 for milling cutters, two motor-driven sensitive drills, a motor-driven jeweler's lathe; a motor-driven variable speed lathe, two screw-cutting engine lathes, 10-inch swing, one 18-inch swing turret lathe with geared friction head and an armature and field coil, motor-driven winding machine, for the Brooklyn navy yard; until the same date for an electric hoist, price to be quoted f. o. b. works; until the same date for a spur and helical gear, motor-driven shaper for Newport, R. I.; until Dec. 8 for an engine lathe for Charleston, S. C.

CENTRAL STATES

CLEVELAND.—Coleman Foundry Co. has increased its capital from $10,000 to $25,000.

CLEVELAND.—Federal Foundry & Supply Co. has increased its capital from $50,000 to $75,000.

CLEVELAND.—Nicola Petti, architect, has plans near completion for Jacob Babin's $80,000 theater and commercial building at Euclid and Lakefront avenues.

CLEVELAND.—United States Engineering department has a permit for a $10,000, two-story, concrete warehouse at the foot of East Ninth street.

CLEVELAND.—City council has authorized the spending of $500,000 for work on the Division avenue filtration plant and for extending water mains.

CLEVELAND.—Mettler-Gloyd Co. has been awarded the contract for the Belmont Co.'s $200,000-office building to be erected at 736-742 Prospect avenue and ready for occupancy Sept. 1; E. F. Gibbons, architect.

CLEVELAND. — Schram-Forsch Co., manufacturer of women's clothing, has ben incorporated; $80,000 capital stock; by J. P. Dawley, A. F. Counts, V. J. Terrell, Marie Santore, Elsie Zimmerman.

COSHOCTON, O. — McClurg Rubber Co.,

Kreolite Floors

A Guaranteed Investment for any Metal Working Plant

Kreolite Wood Block Floor in Machine Shops of Michigan Central Ry., St. Thomas, Ontario.
The Arnold Co., Engineers, Chicago, Ill.

KREOLITE WOOD BLOCK FLOORS increase shop efficiency, have practically no maintenance expense, and will outwear any other type of floor except iron plates.

THE above statement is strong, but its truth will be affirmed by hundreds of industrial concerns who now have Kreolite Wood Block Floors seeing service in their various plants.

THE ARNOLD COMPANY, engineers for the building shown above, after investigating the many kinds of floor construction, decided that a Kreolite Wood Block Floor would best serve their purpose.

THE fact that Kreolite Wood Block Floors are not only extremely durable, but present a good, smooth surface for trucking, and are also very comfortable for the workmen, has caused their use on an efficiency basis.

We have some interesting views and information. A line today will bring it.

THE JENNISON-WRIGHT COMPANY
309 HURON STREET TOLEDO, OHIO

manufacturer, has been incorporated; $20,000 capital stock; by J. S. McClurg, W. A. Hinebaugh, O. D. Tucker, James L. McClurg, William Z. Davis.

DAYTON, O.—Hamilton Paper Mills Co., manufacturer, has been incorporated; $30,000 capital stock; by M. C. Stern, C. F. Bayerl, L. W. James, et al.

DAYTON, O.—A. G. Feight is having plans prepared by Peters & Brown for a four-story, 85 x 156-foot concrete building, to be used by a small manufacturing concern.

EAST LIVERPOOL, O.—T. A. McNicol Pottery Co., manufacturer, has been incorporated; $25,000 capital stock; by T. A. McNicol, S. M. Bennett, P. McNicol, Thos. Cannon, L. F. Bennett.

EAST PALESTINE, O.—Board of trade has arranged with Thomas Padgett for the Wooden Ventilator Co. to erect a two-story, brick factory building in the west end.

HAMILTON, O.—Contract for the Woodsdale bridge, bids for which have been received from the Bailey White Co., Chicago, at about $87,000 will be delayed until spring; bids are to be rejected and re-advertised.

PORTSMOUTH, O.—The board of education plans to build a $75,000 brick, concrete and stucco school, to be known as the Garfield school.

SALEM, O.—C. B. Butler, city-county engineering department, is completing plans for more than 70 bridges and culverts, which are to be constructed along the main market route, No. 14; structures range in size from culverts to bridges of large spans; plans soon will be submitted to the state highway commission and then advertised.

SHILOH, O.—Shiloh Metallic Co. has been incorporated; $100,000 capital stock; by F. J. Prame, J. W. Page, C. G. Wolfersburger, C. L. Backinsto, A. W. Firestone.

TOLEDO, O.—Victor Screw Co, has been incorporated; $5,000 capital stock; by Rudolph Glinski, John N. Detzer, Fred E. Edmunds, Frank A. Carabin, Frank M. Sala.

TOLEDO, O.—Willys-Overland Co. offers to construct a $20,000 concrete bridge over the creek at Central avenue, in consideration of certain concessions by the city in the matter of land.

WOOSTER, O.—City council will consider the immediate construction of a municipal water plant; estimated cost $125,000.

SUMMERSVILLE, W. VA.—Summersville & Gauley River Improvement Co. has been incorporated to build an electric line from Summersville to Brook's Ferry, on Gauley river; $75,000 capital stock; by L. C. Williams, F. N. Alderson, C. E. Thorne, Richwood, W. Va.; O. K. Sutton, Sutton, W. Va.; A. J. Horan, Fayetteville, W. Va.

WHEELING, W. VA. — Paul A. Davis, Philadelphia, has plans for a group of buildings to be erected here by the West Virginia Normal School; an administration building, dormitories and a training school are contemplated; additions will cost $300,000; bids will be asked about Jan. 1.

COVINGTON, KY.—Reliance Textile Co. may add a $20,000 addition to its plant.

HARLAN, KY.—Harlan Ice Co. has been incorported at $6,000 and will build a factory for which a site has been purchased.

LOUISVILLE, KY.—Electric Garage Co. will erect a two-story building shortly which will be equipped for the repair of electric automobiles.

LOUISVILLE, KY.—Henry Freuchtenicht will purchase conveying and grinding machinery soon for an addition to his grain elevator.

LOUISVILLE, KY.—Woodworking equipment will be needed by L. Keller & Sons, contracting carpenters, whose work shop was burned recently with $20,000 loss.

LOUISVILLE, KY.—Southern Gas Products Co., which is to manufacture acetylene welding apparatus and supplies, is in the market for steel-cutting equipment.

LOUISVILLE, KY.—Power equipment requirements of the Kentucky Cotton Yarn Co., Louisville, Trust building, include a 150-horsepower motor and a 40-horsepower motor; address Ira F. Phillips, general manager.

LOUISVILLE, KY.—Milwaukee Bridge Co. has a contract for the erection of the steel work for the Columbia Sanitary Mfg. Co., of which W. G. Probst is general manager; building contracts are being let in detail.

MARION, KY.—Marion Water & Ice Co. has been incorporated; $15,000 capital stock; by R. L. Moore, John T. Pickens, et al.

PADUCAH, KY.—C. E. Weldon and others are planning the development of a lead mine at Sheriden, Ky.

PADUCAH, KY. — Kentucky Southwestern Electric Railway, Light & Power Co. will build a power house, substations and a repair shop in connection with a 50-mile electric railway.

PERRYVILLE, KY.—Perryville Ice & Electric Co. is contemplating the purchase of two additional boilers, 80 horsepower; a steel stack will be also erected.

SOMERSET, KY.—Steam plant of the Somerset laundry was burned recently with $5,000 loss; plans for rebuilding are being considered; Harry Jeffreys, proprietor.

WINCHESTER, KY.—George B. Williams has a franchise for a gas plant at Irvine, Ky., and will built a pipe line from gas wells in that vicinity.

ELKHART, IND.—Fire did about $15,000 damage to the Ideal Steel Wheel Co.'s plant.

INDIANAPOLIS, IND.—Zolene Co., explosive fuel compounds, substitute for auto fuel, has been incorporated; $100,000 capital stock; by John Andrews, Carl G. Fisher, James A. Allison, et al.

INDIANAPOLIS, IND.—Tire weaving machinery, with which automobile tires will be made under a new process, will be manufactured by the Dickenson Tire & Machine Co., recently organized and capitalized at $1,000,000; the officers are: Stoughton A. Fletcher, president, Indianapolis; Fred S. Dickenson, vice president, Bedford, Ind., and Horace C. Stillwell, secretary-treasurer, Anderson, Ind.

KOKOMO, IND.—Kokomo Foundry & Machine Co., automatic stokers, has been incorporated; $30,000 capital stock; by T. O. Callis, H. L. Draper, Lane Johnson, et al.

BELLEVILLE, ILL. — McKinney Tractor Co. recently incorporated at $200,000 by Edwin Abend, G. A. Becker and H. E. Knipkamp, will take over an established plant which will be modernized and added to.

CHICAGO.—Carbo Steel Post Co. has increased its capital stock from $15,000 to $150,000; its main office is at 538 South Clark street.

DANVILLE, ILL.—Bridge shop and pattern rooms of the Chicago & Eastern Illinois railroad was badly damaged by fire.

EAST ST. LOUIS, ILL.—Wm. Rothe has started on the erection of a one-story, 50 x 109-foot, brick machine shop.

DETROIT.—Hudson Motor Co. will construct a third story to its plant, 60 x 2,200 feet.

DETROIT.—Magee Sheet Metal Machinery Co. has been incorporated; $10,000 capital stock; by Wilbur R. Magee, Frank W. Atkinson, Dessie Magee.

DETROIT.—Detroit Boiler Specialty Co. has been incorporated; $15,000 capital stock; by Wm. E. H. Lang, W. S. Reynolds, David M. Kerr.

DETROIT. — Allyn Brass Foundry Co., Cleveland, O., and Detroit, Mich., has filed articles of incorporation at Lansing, Mich., with a capital of $125,000.

ECORSE, MICH.—Kay Salt Co. is spending over $50,000 on additional buildings and improvements.

LANSING, MICH.—Twenty business men are considering promoting the manufacture of a small auto.

NILES, MICH.—William A. Reddicks Wire Specialty factory was badly damaged by

Some More Tips

Although business conditions are improving, you can't afford to let anything slip by; read these—

Baldwin Locomotive Works, Philadelphia, which has been figuring on a shrapnel contract, has asked for bids on an extensive list of machine tools.

American Iron & Steel Mfg. Co., Lebanan, Pa., is in the market for a 15-ton, telescoping crane.

The bureau of yards and docks, navy department, Washington, D. C., will take bids some time after Jan. 1 for the erection of a $400,000 power plant at Indian Head, Md. This department also will open bids some time in December for three cranes for Pearl Harbor, Hawaii.

Winchester Repeating Arms Co., New Haven, Conn., has been granted a permit to erect at once buildings, estimated to cost $95,200. The buildings include a one-story, 53 x 208-foot, fireproof drop forge shop; a $21,000, 52 x 161-foot, fireproof hydraulic press building; a $24,000, 52 x 201-foot building for the finishing department, part to be two stories and part one story, and an addition to the heat-treating department. The company also is having plans drawn for a $100,000 shot tower.

McClintic-Marshall Co., Pittsburgh engineer, has drawn plans for a $60,000, one-story, 145 x 528-foot, steel, corrugated iron and concrete addition to the plant of the Empire Rolling Mill Co., Bessemer avenue and Pennsylvania railroad, Cleveland, contract for which will be let within a month. C. J. Barkwill is president of the Rolling Mill company; W. W. Ellenberger, vice president, and D. R. James, secretary-treasurer.

Dickenson Tire & Machine Co., Indianapolis, Ind., recently organized with $1,000,000 capital, will manufacture tire weaving machinery, for making automobile tires under a new process. Fred S. Dickenson, vice president of the company, Bedford, Ind., is the inventor of the machine.

fire; loss about $90,000 was covered by insurance.

ANTIGO, WIS.—Reed Bros. and C. W. Van Doren have purchased a site at Sixth and Superior streets and will erect a fireproof garage and machine shop, 60 x 72 feet, two stories, with one elevator.

APPLETON, WIS.—Board of trustees, Lawrence College, Appleton, has commissioned Architects Childs & Smith, Chicago, to prepare plans for a group of college buildings to cost $200,000, the first unit, a $40,000 dormitory, will be started during the winter. It will be of brick and steel, 60 x 150 feet, three stories; Samuel Plantz is president.

BEAVER DAM, WIS.—Plant of the Paramount Metal Form Drying Co., manufacturing a device for knitting mills, was badly damaged by fire last week and will be rebuilt at once.

COLUMBUS, WIS.—Common council of Columbus, Wis., is considering the installation of a central heating plant to utilize the waste steam from the municipal electric light and water plant.

DE PERE, WIS.—Engineers of the Wisconsin State Highway Commission have started work on tentative plans for a bridge to replace the so-called long bridge over Fox river, including a drawbridge or bascule, the whole being estimated to cost $100,000. Estimates are also being prepared for the repair of the present steel structure, but the new construction project is finding more favor that the repair proposition; J. Steckart is mayor.

HUDSON, WIS. — Fire last week badly damaged the brick and frame garage and repair shop building of the Hudson Automobile Co., W. M. Grant, proprietor; it probably will be rebuilt at once.

JOHNSON CREEK, WIS. — Trachte & Grahlman, automobiles and farm machinery, are building a fireproof addition to their warehouse, to be used as a garage and machine shop.

LADYSMITH, WIS.—The Mantellate Sisters, O. S. M., have plans for a hospital, 60 x 110 feet, three stories, to be erected early next spring; foundations will be laid this fall.

MADISON, WIS. — Common council of Madison has been obliged to defer the project of installing a garbage plant for at least one year by reason of economy in making up the 1915 budget. A garbage plant of the incinerator type was to have been built during the coming year, making an investment of from $20,000 to $30,000.

MADISON, WIS.—Bids for the entire construction of the proposed Physics building for the University of Wisconsin will be taken until Dec. 15 by M. E. McCaffrey, secretary, board of university regents, Madison; plans were prepared by Arthur Peabody, university architect, and call for an expenditure of approximately $250,000, including equipment.

MARINETTE, WIS.—County highway commissioner has awarded the contract for the erection of a steel I-beam bridge, three-span, in the town of Porterfield, to the Vulcan Mfg. Co., Fond du Lac, Wis.

MARSHFIELD, WIS.—Weinberg Construction Co. was awarded the general contract for the erection of a cold storage and general warehouse for the C. E. Blodgett Co. of Marshfield; it will be of brick, 50 x 50 feet, four stories, with elevators and refrigerating system.

MILWAUKEE.—Phyar Extinguisher Co. has been incorporated; $100,000 capital stock; by W. C. Schultz, R. Pfeil Jr., H. Zottel; W. C. Wehe, attorney.

MILWAUKEE.—Milwaukee Belting & Supply Co. has been incorporated; $10,000 capital stock; by L. H. Koenig, W. A. Zabel, F. P. Brownell; Rubin & Zabel, attorneys.

MILWAUKEE, WIS.—Van Ryn & DeGelleke, architects, are preparing plans for a $75,000 gymnasium to be erected at the Milwaukee normal school early next year; William Kittle, Madison, Wis., is secretary, board of normal regents.

MILWAUKEE, WIS.—Cudahy Bros. Co. awarded the general contract for the erection of a cold storage plant and branch warehouse at Locust street and Humboldt avenue, Milwaukee, to William F. Tubesing, Matthews building, Milwaukee. Previously noted.

MILWAUKEE, WIS.—Construction of the proposed tunnel to connect the new Linnwood avenue intake with North point pumping station, will not be undertaken until late in 1915 because the budget provides only $175,000, or three-fourths of the amount necessary; plans have been completed by George F. Staal, city engineer; F. G. Simmons is commissioner of public works.

RACINE, WIS.—Standard Electric Works, manufacturer of motor-driven appliances, such as vacuum cleaners, blowers, fans, etc., has increased its capital from 25,000 to $100,000.

RHINELANDER, WIS. — Rhinelander Advancement Association is raising a fund of $75,000 among local capital for the erection of a hotel; S. B. Gary is chairman of the building committee.

SHEBOYGAN, WIS. — Universal Oxygen Co., is preparing to double the capacity of its plant as well as install equipment for the manufacture of tanks.

WAUSAU, WIS.—Village of Mosinee and township of Kronenwetter, Marathon county, have passed a joint resolution authorizing a tax levy of $25,000 to build a steel bridge over Wisconsin river at Mosinee; project will be assisted by the state highway commission, which will add one-third, or $8,500, making in all $33,500 available for the construction.

SOUTHERN STATES

WICHITA FALLS, TEX.—Capitalists of this city are considering the organization of a company for the manufacture of stoves; if plans mature a factory will be built.

MEMPHIS, TENN.—Kelsey Wheel Co. will enlarge its factory at an estimated cost of $100,000 for building and machinery; John Kelsey, president.

OKLAHOMA CITY, OKLA.—Acme Pipe & Foundry Co. has been incorporated; $3,000 capital stock; by S. H. Fleet, M. K. Weigel, W. S. Nelson.

WESTERN STATES

BUTTE, MONT.—Gilmore & Pittsburgh railroad, constructed at a cost of $15,000,000, extending from Armstead, Mont., to Gilmore, Ida., has been purchased by the Northern Pacific Railway Co. and a survey has been made from Salmon to Lewiston for a line to connect with the Northern Pacific. Construction of 60 miles of road in Montana from Armstead to Twin Bridges will afford the Northern Pacific a new water level coast route, shorter by 120 miles than the present line. W. N. Richler, superintendent.

DEER LODGE, MONT.—It is announced that work will be resumed on the electrification of the Milwaukee line through this section; contract for 114 miles of the work has been let to the Montana Power Co.

PLENTYWOOD, MONT.—Business men propose an electric road from this place to Raymond, to connect with the Soo line.

ARLINGTON, WASH.—Jim Creek Water, Light & Power Co. has asked the commissioners of Snohomis county for a franchise to operate electric lines along certain roads.

OKANOGAN, WASH.—George H. Keith, Okanogan and Spokane, will have plans prepared about Dec. 5 for a $50,000 court house to be erected in Okanogan, same to be of reinforced concrete and hollow tile construction, with steam heating plant and five vaults.

REPUBLIC, WASH. — Western Union Mines have purchased a cyanide mill and contemplates the installation of additional machinery.

SEATTLE.—Seattle Brewing & Malting Co. expects to erect a $500,000 brewery in California; Louis Hemrich, president.

SEATTLE.—Balbo Hydraulic Mining & Dreding Co. has been incorporated; $500,000 capital; by Harry LeBarr, C. B. Stone, 1735 Sixteenth avenue.

SEATTLE.—General contract of the $850,000 Sears, Roebuck & Co. building was let to Grant Smith & Co., Henry building, Seattle; contract calls for enclosing building only. Bids for heating, electric wiring and mechanical work are under consideration. It is reported the contract for inclosing the structure was let at approximately $650,000.

PORTLAND, ORE.—The advisory bonding committee of the interstate bridge has decided to advertise remaining $1,000,000 bridge bonds for sale; bids will be called for the construction as soon as preliminaries are concluded.

PORTLAND, ORE.—Williamette Iron & Steel Works, Portland, have been awarded the contract at $300,000 for repairs to Steamer Catailina, recently damaged by fire; they also have been awarded a contract at $29,825 for the construction of a wooden hull for the dredge Monticello.

SALEM, ORE.—H. L. Bowlby, state highway engineer, has submitted an estimate of the cost of the proposed bridge across the Williamette river at this place at $188,583 to $273,294, according to the street; it is proposed to make the main part of structural steel.

HUNTER'S POINT, CAL.—Contract for the construction of a dry dock here has been awarded to the Union Iron Works, San Francisco, at $2,000,000.

LOS ANGELES.—Pressed Steel Wheel Co. has been incorporated $100,000; by H. T. Payne, J. H. Johnston, G. Bennington, T. E. Stanton and C. W. Hubbard.

NEW CATALOGS

CHAIN HOIST.—The Wright Manufacturing Co., Lisbon, O., has issued a 24 page catalog devoted to its line of hoists, blocks and trolleys. The hoists which are described and illustrated include both high speed and standard screw hoists.

VALVES.—An eight-page bulletin, illustrating and describing sluice valves manufactured by the Coffin Valve Co., Neponset, Mass., recently has been issued. In addition to sluice valves, this bulletin describes check valves, gate valves, hydrants and other devices for controlling the flow of water.

POLISHING AND BUFFING MACHINERY.—A recent catalog issued by the Webster & Perks Tool Co., Springfield, O., is devoted to its line of polishing and buffing machinery, including electrically-driven, floor-type polishing and buffing lathes, self-oiling grinding and polishing machines, three-quarter grinder, electrically-driven, floor-type grinder, ball bearing polishing and buffing lathe, etc.

LIGHTING AND VENTILATING DEVICES.—A handsomely-illustrated and well-arranged 84-page catalog has been issued by the David Lupton's Sons Co., Philadelphia, which is devoted to the products manufactured by this company for lighting and ventilating industrial plants, warehouses, etc. Numerous illustrations are included showing various buildings containing this type of steel sash for partitions. The Pond sash operating device also is illustrated, as well as methods of constructing skylights, etc.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to April 1.)

Bessemer, valley	$13.75 to 14.00
Bessemer, Pittsburgh	14.70 to 14.95
Basic, Pittsburgh	13.45 to 13.60
Basic, eastern Pa.	13.50
Malleable, Pittsburgh	13.70 to 13.95
Malleable, Chicago	13.00 to 13.50
Malleable, Philadelphia	14.50 to 15.00
Malleable, Buffalo	12.00 to 13.00
No. 1X Philadelphia	14.75 to 15.00
No. 2 foundry, Pittsburgh	13.70 to 13.95
No. 2 foundry, Cleveland	13.25 to 13.50
No. 2 foundry, Ironton	13.00
No. 2 foundry, Chicago	13.00 to 13.50
No. 2X foundry, Philadelphia	14.25 to 14.50
No. 2X fdy., (N. J. tidewater)	14.00 to 14.25
No. 2X foundry, Buffalo	12.75 to 13.00
No. 2 plain, Philadelphia	14.00 to 14.25
No. 2 plain, (N. J. tidewater)	13.75 to 14.00
No. 2 plain, Buffalo	12.75 to 13.00
No. 2 southern, Birmingham	10.00
No. 2 southern, Cincinnati	12.90
No. 2 southern, Chicago	14.00 to 14.25
No. 2 southern, Phila. delivery	14.50
No. 2 southern, Cleveland	14.00
No. 2 south'n, New York, docks	14.25 to 14.50
No. 2 southern Boston, docks	14.25 to 14.50
No. 2 south'n interior New Eng.	15.00 to 16.00
No. 2 southern, St. Louis	13.75 to 14.00
Virginia No. 2X furnace	12.25 to 12.75
Virginia 2X, Philadelphia	15.00 to 15.25
Virginia, 2X, Jersey City	15.25 to 15.50
Virginia, 2X, Boston points	15.50 to 15.75
Gray forge, (eastern Pa.)	13.50 to 13.75
Gray forge, Pittsburgh	13.45 to 13.70
Gray forge, Birmingham	9.00 to 9.50
Silveries, 8 per cent, Cleveland	17.63
Silveries, 5 per cent Birmingh'm	12.50
Silveries, 5 per cent, Chicago	16.35
Standard low phos., Phil.	19.00 to 20.00
Lebanon low phos., furnace	16.00 to 16.50
Low phos., Pittsburgh	20.95 to 21.20
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16.50
Charcoal, Buffalo	15.75 to 16.75
Charcoal, Birmingham	25.00

IRON ORE

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.50
Old range, non-Bess., 51½ per cent	3.00
Mesabi non-Bessemer, 51½ per cent	2.85

(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	7c
Foreign non-Bess., 50 to 65 per cent	7c

COKE

(At the ovens.)

Connellsville furnace	$1.60 to 1.75
Connellsville fur. contr.	1.65 to 1.75
Connellsville foundry	2.00 to 2.40
Connellsville fdy., contr.	2.25 to 2.50
Wise county furnace	1.75 to 2.00
Wise county foundry	2.10 to 2.40
Pocahontas furnace	1.75 to 2.00
Pocahontas foundry	2.00 to 2.25
New River, foundry	2.50 to 3.00
New River, furnace	2.00 to 2.25

FERRO-ALLOYS

Ferro-manganese, Baltimore	$68.00
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent, Pgh.	22.90
Ferro-sil., 11 to 12 per cent, Pgh.	21.90
Ferro-sil., 10 to 11 per cent, Pgh.	20.90
Ferro-sil., 9 to 10 per cent, Pgh.	19.90
Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Open-hearth billets, Phila.	$21.40 to 21.90
Forging billets, Phila.	24.40 to 25.40
Forging billets, Pbgh. (nom.)	24.00 to 24.50
Wire rods, Pittsburgh	$25.00 to 26.00
Billets, Pbgh. and Ygnst.	$19.00 to 19.50
Sheet bars, Pbgh. and Ygnst.	19.50 to 20.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Lgt. rails, 8 lbs., Pbgh. & Chgo.	1.22c
Lgt. rails, 12 lbs., Pbgh. & Chgo.	1.17c
Lgt. rails, 16 to 20 lbs., Pbgh. & Chgo.	1.12c
Lgt. rails, 25 to 45 lbs., Pbgh. and Chgo.	1.07c
Relaying rails, standard, Pbgh. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chicago	21.50 to 22.50
Angle bars, st. sect. Pbgh. base	1.50c
Angle bars, st. sections, Chgo.	1.50c
Spikes, railroad, Pbgh.	1.40c to 1.45c
Spikes, railroad, Chgo.	1.50c
Track bolts, Pbgh.	1.85c
Track bolts, Chgo.	2.00c

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.05c to 1.10c
Structural shapes, Chicago	1.25c to 1.34c

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama Canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.25
From Pittsburgh	.41
From Youngstown	.43
From Niles	.43
From Wheeling	.41
From Steubenville	.41
From Johnstown	.395
From Coatesville	.34
From Steelton	.35
From Bethlehem	.325
From Cleveland	.44
From Chicago	.55

Structural shapes, Philadelphia	1.25c to 1.30c
Structural shapes, New York	1.26c to 1.31c
Structural shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.25c to 1.34c
Tank plates, Pittsburgh	1.05c to 1.10c
Tank plates, Philadelphia	1.25c to 1.30c
Tank plates, New York	1.25c to 1.30c
Bars, soft steel, Pittsburgh	1.05c to 1.10c
Bars, soft steel, Chicago	1.25c to 1.34c
Bars, soft steel, Philadelphia	1.25c to 1.30c
Bars, soft steel, New York	1.26c to 1.31c
Hoops, carloads, Pittsburgh	1.25c
Hoops, less carloads, Pittsburgh	1.30c
Bands, Pittsburgh	1.10c
Shafting, carloads, Pbgh., disc. contract	66 to 67
Shaft'g less carl'ds, Pbgh., disc.	63
Bar iron, Chicago	0.95c to 1.05c
Bar iron, Philadelphia	1.12c to 1.19c
Bar iron, New York	1.10c to 1.20c
Bar iron, Cleveland	1.15c to 1.20c
Bar iron, Pittsburgh	1.20c
Hard steel bars, Chicago	1.25c to 1.30c
Smooth finish. mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.85c to 1.90c
No. 28, black, Chicago	2.09c to 2.14c
No. 28, tin mill, black, Pbgh.	1.90c
No. 28, galvanized, Pbgh.	2.85c to 2.90c
No. 28, galvanized, Chgo.	2.99c to 3.09c
No. 10, blue, annealed, Pbgh.	1.35c to 1.40c
No. 10, blue, annealed, Phila.	1.55c to 1.60c
Tin plate, 100 lb., coke, base	$3.15 to 3.25

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll., and re-an.	30 cents
Hot roll'd, pickl'd and ann., tin mill	25 cents
Full pickled, cold rolled and re-ann.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller levelling	10 cents
Patent levelling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxidizing	10 cents
Lime finish	10 cents
Open hearth steamping steel, free from mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents

Extra deep special auto body stock $1.25

Ext. for 28 gage ov. 32 to 36-in. wide 10 cents
No reduction for sheets not annealed

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black Butt-weld.	Galv. Butt-weld.
Steel, ⅜ to 3 inches	81	72½
Iron, ⅜ to 2½ inches	70	61
	Lap-weld.	
Stele, 2½ to 6 inches	80	71½

BOILER TUBES

Steel, 3½ to 4½ inches	73
Iron, 3½ to 4½ inches	60

WIRE PRODUCTS

Wire nails, jobbers, Pittsburgh	$1.55
Wire nails, retailers, Pittsburgh	1.60
Plain wire, jobbers, Pittsburgh	1.35
Plain wire, retailers, Pittsburgh	1.40
Galvanized wire, jobbers, Pbgh.	1.75
Galvanized wire, retailers, Pbgh.	1.80
Polished staples, Pbgh.	1.55
Galvanized staples, Pbgh.	1.95
Barb wire, painted, jobbers, Pbgh.	1.55
Barb wire, painted, retail'rs, Pbgh.	1.60
Barb wire, galv., retail's, Pbgh.	2.00
Barb wire, galv., jobbers, Pbgh.	1.95

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 80 and 20; cut threads 80 and 15; larger or longer, 75 and 15.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter, rolled, 80 and 25; cut, 80 and 20; larger or longer, 80.

Gimlet and cone point lag or coach screws, 80 and 25.

Hot pressed square, blank or tapped nuts, $6.30 off list; hot pressed hexagon blank or tapped, $7.20 off.

Cold pressed, c. and t. square, blank or tapped, $6 off; hexagon, blank or tapped, ⅜ inch and larger, $7.20; ⅛-inch and smaller, $7.80.

RIVETS

Structural rivets, Pbgh.	1.45c to 1.50c
Structural rivets, Chgo.	1.68c
Boiler rivets, Pbgh.	1.55c to 1.60c
Boiler rivets, Chgo.	1.7c

SCREWS

(New York.)

Lag, gimlet and cone point	80 and 20
Coach, gimlet point	80
Standard Jack	70 and 10
Mch., cut thread, flat head	50 and 10
Mach., cut threal, round head	50 and 10 and 10
Mch., cut thread, fillister hd.	40 and 40 and 10
Mch. rolled thread, flat head or round head	80 and 10
Set screws, iron	75 and 10 and 10
Set screws, steel, per cent advance over iron	25
Square head cap screws	70 and 10 and 10
Hexagon head cap screws	70 and 10 and 10
Fillister head cap screws	60 and 10 and 10
Flat head wood screws	10 and 10 and 5
Round head wood screws	10 and 10 and 5

IRON AND STEEL PRICES

Corrected up to Tuesday noon

WROUGHT STEEL CAR WHEELS

33-inch engine truck wheels	$22.50
36-inch engine truck wheels	23.50
33-inch tender wheels	18.50
36-inch passenger train car and tender wheels	21.50
33-inch freight car wheels	15.50

All with standard 2½ inch rims and minimum standard hubs, usual extras applying for thicker rims and larger hubs; all f. o. b. cars, Pittsburgh.

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	1.55c to 1.60c

TWISTED REINFORCING BARS

(Soft steel, Pittsburgh mill.)

¼-inch and larger	1.15c to 1.20c
⅝-inch	1.20c to 1.25c
½-inch	1.55c to 1.60c
⅜-inch	1.40c to 1.45c
¼-inch	1.65c to 1.75c

WIRE ROPE

Galvanized, iron and steel	47½ and 2½
Bright, iron and steel	55 and 2½

COLD ROLLED STRIP STEEL

(Subject to regular extras.)

Base price Cut to length		0.10 to 0.19 Carbon
Hard.	Soft.	1½ in. and wider.
2.85	3.10	0.100 and thicker.
2.95	3.20	0.050 to 0.099 inc.
3.10	3.35	0.035 to 0.049 inc.
3.35	3.75	0.031 to 0.034 inc.
3.60	4.00	0.025 to 0.030 inc.
3.80	4.20	0.020 to 0.024 inc.
4.70	5.20	0.017 to 0.019 inc.
5.10	5.60	0.015 and 0.016
5.95	6.45	0.013 and 0.014
6.55	7.05	0.012
6.90	7.40	0.011
7.25	7.75	0.010
Coils		
2.75	3.00	0.100 and thicker
2.80	3.05	0.050 to 0.099 inc.
2.95	3.20	0.035 to 0.049 inc.
3.10	3.50	0.031 to 0.034 inc.
3.20	3.60	0.025 to 0.030 inc.
3.30	3.70	0.020 to 0.024 inc.
3.60	4.10	0.017 to 0.019 inc.
4.00	4.50	0.015 and 0.016
4.70	5.20	0.013 and 0.014
5.05	5.55	0.012
5.40	5.90	0.011
5.75	6.25	0.010

CAST IRON PIPE

Three to 20 in., Cleveland	$21.50
Twenty-four to 48-inch, Cleveland	21.00
Four-inch, water, Chicago	26.00
Six to 12 inches, Chicago	24.00
Larger sizes, Chicago	23.50
Six-inch, water, New York	20.00 to 20.50
Four-inch, water, Birmingham	19.50
Six-inch and larger, Birmingham	19.50

Gas pipe, $1 per ton higher than water.

WAREHOUSE PRICES

Steel bars, Chicago	1.65c
Steel bars, Cleveland	1.80c
Steel bars, Cincinnati	1.70c to 1.85c
Steel bars, Philadelphia	1.65c to 1.70c
Steel bars, New York	1.80c
Steel bars, St. Louis	1.70c
Iron bars, Chicago	1.65c
Iron bars, Cleveland	1.75c
Iron bars, St. Louis	1.65c
Iron bars, Cincinnati	1.65c to 1.75c
Iron bars, Philadelphia	1.50c to 1.55c
Iron bars, New York	1.65c to 1.70c
Hoops, Chicago	2.15c
Shapes and plates, Chicago	1.75c
Shapes and plates, Cleveland	1.90c
Shapes and plates, Cincinnati	1.80c to 1.90c
Shapes and plates, St. Louis	1.80c
Shapes and plates, Philadelphia	1.60c to 1.65c
Shapes and plates, New York	1.85c
No. 10 blue ann. sheets, Chgo.	1.95c
No. 10 blue ann. sheets, Cleve.	2.05c
No. 10 blue ann. sh., St. Louis	2.00c
No. 10 blue ann. sheets, Cinci.	1.95c
No. 28 black sheets, Chgo.	2.55c
No. 28, black sheets, Cleveland	2.45c
No. 28 black sheets, Cincinnati	2.45c to 2.55c
No. 28 black sh., St. Louis	2.55c
No. 28 galv. sheets, Chgo.	3.55c
No. 28 galv. sheets, Cleveland	3.35c
No. 28 galv. sheets, Cincinnati	3.40c to 3.55c
No. 28 galv. sheets, St. Louis	3.55c

Freight Rates, Coke

Connellsville regions, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.70
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

No. 1 railroad wrought, Chgo.	$ 7.50 to 7.75
No. 1 railroad wrought, Cleve.	9.00 to 9.50
No. 1 railroad wrought, St. L.	7.00 to 7.25
No. 1 railroad wrought, Cinci.	8.00 to 8.50
No. 2 railroad wrought, Chgo.	7.00 to 7.25
No. 2 railroad wrought, St. L.	7.00 to 7.25
Arch bars and transoms, Chgo.	10.75 to 11.00
Arch bars and transoms, St. L.	10.25 to 10.50
Knuckles, coup. & spr'gs, Chgo.	8.75 to 9.00
Knuckles, coup. & spr'gs, St. L.	8.00 to 8.25
Shafting, Chicago	11.50 to 12.00
Shafting, St. Louis	10.00 to 10.25
Steel car axles, Chgo.	10.50 to 10.75
Steel car axles, St. Louis	10.00 to 10.25
Locomotive tires, Chicago	9.00 to 9.50
Locomotive tires, St. Louis	8.00 to 8.25
Cut forge, Chicago	7.00 to 7.25

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 pounds to:—	
New York	16 cents
Philadelphia	15 cents
Boston	18 cents
Buffalo	11.6 cents
Baltimore	14.5 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Kansas City, Mo.	43.6 cents
Omaha	43.6 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, (all rail)	80 cents
Pacific coast, via Panama can'l	41 cents

Pipes and flues, Chicago	$ 5.75 to 6.00
Pipes and flues, Cleveland	6.75 to 7.00
Pipes and flues, St. Louis	5.00 to 5.25
No. 1 cast, Chicago	9.00 to 9.25
No. 1 cast, Cleveland	9.75 to 10.25
No. 1 cast, Cincinnati	8.50 to 9.00
No. 1 cast, St. Louis	9.00 to 9.25
No. 1 busheling, Chicago	6.50 to 6.75
No. 1 busheling, Cleveland	8.00 to 8.25
No. 1 busheling, Cincinnati	5.75 to 6.25
No. 1 busheling, St. Louis	6.50 to 6.75
No. 2 busheling, Chicago	5.25 to 5.75
No. 1 boiler plate, cut Chgo.	5.50 to 5.75
No. 1 boiler plate, cut, Buffalo	9.00 to 9.50
No. 1 boiler plate, cut, St. L.	5.50 to 6.00
Boiler punchings, Chicago	8.25 to 8.75
Cast borings, Chicago	4.50 to 5.00
Cast borings, Cleveland	5.50 to 5.75
Cast borings, Cincinnati	4.25 to 4.75
Cast borings, St. Louis	3.50 to 4.00
Machine shop turnings, Chgo.	4.50 to 4.75
Machine shop turnings, Cleve.	5.00 to 5.25
Machine shop turnings, Cinci.	4.25 to 4.75
Machine shop turnings, St. L.	4.00 to 4.50
Malleable agl., Chicago	7.50 to 7.75
Malleable agricultural, St. Louis	5.75 to 6.00
Malleable, railroad, Chicago	7.75 to 8.25
Malleable, railroad, Cincinnati	6.50 to 7.00
Malleable, railroad, St. Louis	6.00 to 6.75
Angle bars, iron, Chicago	10.50 to 11.00
Angle bars, iron, St. Louis	9.25 to 9.50
Angle bars, steel, Chgo.	7.75 to 8.00
Angle bars, steel, St. Louis	8.00 to 8.25
Stove plate, Chicago	8.25 to 8.50
Stove plate, Cleveland	7.50
Stove plate, Buffalo	9.00 to 9.75
Stove plate, Cincinnati	6.50 to 7.00
Stove plate, St. Louis	7.00 to 7.25
Bundled sheet, Cincinnati	4.00 to 4.50

(Gross Tons.)

Heavy melting steel, Pbgh.	$10.00 to 10.25
Heavy melting steel, Buffalo	10.00 to 10.50
Heavy melting steel, Chicago	8.00 to 8.50
Heavy melting steel, Cleveland	9.25 to 9.50
Heavy melting steel, Cincinnati	9.00 to 9.50
H'vy melting steel, eastern Pa.	9.50 to 10.00
Heavy melting steel, New York	7.50 to 7.75
Heavy melting steel, St. Louis	10.50 to 11.00
Bundled sheet, Buffalo	6.25 to 6.50
Grate bars, Buffalo	9.00 to 9.25
Grate bars, New York	6.50 to 7.00
No. 1 railroad wr'ght, east. Pa.	11.50 to 12.00
No. 1 railroad wrought, Pbgh.	10.00 to 10.50
No. 1 R. R. wght., New York	8.50 to 9.00
No. 1 R. R. wrought, Buffalo	10.00 to 10.50
Shafting, New York	11.00 to 11.50
Shafting, eastern Pa.	13.00 to 14.00
Wrought pipe, New York	7.25 to 7.50
Wrought pipe, eastern Pa.	9.25 to 9.75
Mch. shop turnings, New York	5.00 to 5.25
Machine shop turnings, Buffalo	5.50 to 6.00
Mch. shop turnings, Pbgh.	7.50 to 8.00
Mch. shop turnings, eastern Pa.	7.75 to 8.00
Cast borings, New York	5.00 to 5.25
Cast borings, eastern Pa.	7.75 to 8.00
Cast borings, Buffalo	6.00 to 6.50
Cast borings, Pittsburgh	8.00 to 8.50
Stove plate, (Jersey points)	8.00 to 8.50
Stove plate, Pittsburgh	9.00
Stove plate, eastern Pa.	8.00 to 8.50
Shoveling steel, Chicago	7.25 to 8.00
Shoveling steel, St. Louis	7.00 to 7.25
Reroll'g rails, 5 ft. & ov., Pbgh.	11.50
Reroll. rails, 5 ft. & ov., Chgo.	9.50 to 9.75
Reroll. rails, 5 ft. & ov., Cleve.	11.00 to 11.50
Reroll. rails, 5 ft. & ov., E. Pa.	10.50 to 11.00
Reroll. rails, 5 ft. & ov., St. L.	9.50 to 9.75
Steel rails, short, Chicago	9.00 to 9.50
Steel rails, short, Cleveland	11.00 to 11.50
Steel rails, short, St. Louis	8.75 to 9.00
Iron rails, Cleveland nom.	11.75 to 12.00
Iron rails, Cincinnati	10.25 to 10.75
Iron rails, eastern Pa.	13.50 to 14.00
Iron rails, St. Louis	9.75 to 10.00
Iron rails, Pittsburgh	13.00 to 13.50
Frogs, switches, guards, Chgo.	8.50 to 8.75
Frogs, switches & g'rds, St. L.	9.00 to 9.25
Car wheels, (iron), Pittsburgh	10.50 to 11.00
Car wheels, (steel), Pittsburgh	11.50 to 12.50
Car wheels, Chicago	10.00 to 10.25
Car wheels, eastern Pa.	10.00 to 10.50
Car wheels, Buffalo	10.50 to 11.00
Car wheels, (N. J. points)	9.25 to 9.50
Car wheels, St. Louis	9.50 to 10.00
Iron axles, Pittsburgh	18.00 to 19.00
Iron axles, Cincinnati	19.00 to 20.00
Iron axles, eastern Pa.	18.50 to 19.00
Iron axles, Buffalo	19.00 to 19.50
Iron axles, Chicago	15.00 to 15.50
Steel car axles, New York	11.00 to 11.50
Steel car axles, Buffalo	12.00 to 12.50
Steel car axles, Cleveland	12.00 to 12.50
Steel car axles, eastern Pa.	12.50 to 13.00
No. 1 busheling, Buffalo	8.25 to 8.75
No. 1 busheling, Pittsburgh	9.00
No. 2 busheling, Buffalo	5.75 to 6.25
Low phosphorus steel, Buffalo	14.00 to 14.50
Low phosphorus steel, Pbgh.	13.00 to 13.50
Low phos. steel, eastern Pa.	13.50 to 14.00
No. 1 forge, eastern Pa.	8.00 to 8.25
No. 1 cast, eastern Pa.	11.25 to 11.75
No. 1 cast, Pittsburgh	11.00 to 11.50
No. 1 cast (N. J. points)	10.25 to 10.50
Mall. iron, agricul., Cleveland	9.00 to 9.50
Mall. iron R. R., Cleveland	9.00 to 9.25
Malleable, railroad, Pittsburgh	9.50 to 10.00
Mall. R. R., Buffalo	9.25 to 9.75
Mall. R. R. east. Pa.	8.50 to 9.00
Bundled sheet, Pittsburgh	8.00 to 8.25
Bundled sheet, Cleveland	7.50

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Exhaust Steam Turbine Practice

(*Continued from page* 1035)

pressure stage and also preventing fluctuation in back pressure on the engine caused in the type described. A large number of such machines have been installed, some of the more notable examples of their use in the iron and steel industries being shown by the accompanying illustrations.

The conditions which determine the selection of a low-pressure turbine or a mixed pressure turbine relate solely to operations. Each type of turbine generally is built to be capable of carrying its full load either with low-pressure steam alone or with live steam alone; but, as the boiler plant will naturally be proportioned to furnish sufficient steam to carry this load after such steam has passed through the reciprocating engine, the question of boiler capacity will not ordinarily affect the selection. The determining condition is the relation of the periods during which the turbine will operate with exhaust steam to the periods of using live steam. Unless the latter amount to more than one-third, say, of the aggregate operation on low-pressure steam, the standard low-pressure machine will, as a rule, be found preferable. In most combined engine and low-pressure turbine plants the operation of the turbine on live steam is an emergency condition; so that a mixed pressure turbine need only be used where it will give better overall economy.

Ore Reserves in United States

(*Continued from page* 1046)

ern lands was estimated at 235,416,756 tons. If all ore above a minimum of 45 per cent of iron is considered, there would be an additional iron ore reserve in the Lake Superior district of at least 2,000,000,000 tons, and if the minimum is 35 per cent, 70,000,000,000 tons. The Adirondack region of New York was estimated to contain 800,000,000 tons, which would yield 300,000,000 tons of furnace ore; and for southeastern New York 60,000,000 tons of reserves were estimated. New Jersey was stated to contain 130,000,000 tons of reserves, of which 30,000,000 tons were shipping ore, and the balance would yield 40,000,000 tons of concentrates carrying 60 per cent iron. In Alabama, the Birmingham district was estimated as having 1,300,000,000 tons, the Russellville district 100,000,000 tons, and eastern Alabama not over 25,000,000 tons. Virginia was credited with 100,000,000 tons and Texas, in Cass and adjoining counties, has 250,000,000 tons of brown ores.

To the above could be added reserves of considerable quantities in mines which have been exploited, and possibilities of known iron ore deposits in sections of the country which have not heretofore supplied iron ores or offered a market for them.

In nearly all the political divisions of the United States iron ores of apparently desirable quality and quantity are known to exist and geological reports upon a number of important iron ore deposits demonstrate the probabilities of liberal extensions beyond present exploitation in depth or length or both, and the working of mines has in many instances fully warranted the geologists' conclusions.

To the above may be added the foreign sources which may supplement the domestic supply of iron ores, upon some of which testimony was presented in the litigation above mentioned. Cuba was estimated to have 3,000,000 to 6,000,000 tons of hard ore and 3,000,000,000 to 3,400,000,000 tons of soft ores. The Tofo mines in Chili had a mountain of ore, which for a distance of but half way from the top was estimated to have 150,000,000 tons of

67.5 per cent ore, and if taken to the level of the valley would yield probably three or four times as much.

The Newfoundland iron ores were estimated at 3,250,000,000 to 5,000,000,000 tons, and in the Minas Geraes district of Brazil 7,000,000,000 to 8,000,000,000 tons of 60 per cent iron ore were claimed. Sweden is credited with 1,500,000,000 tons of reserves in Kuruna and 493,000,000 tons in other deposits.

Another phase in estimates of reserves is the changing demand for ores of specific compositions, as was instanced by the apparent scarcity of ore of Bessemer grade being the incentive for a liberal development of the basic open-hearth steel industry, thus making available much mineral formerly considered under the ban and reducing the premium on Bessemer ores. Millions of tons of concentrated ore, treated to raise the iron content or eliminate undesirable constituents, are now annually used in the United States. Northern New York contributes large amounts of magnetic concentrates, Minnesota and the southern states supply quantities of washed ore, suggesting that other deposits in which the mineral is lean in iron, or which contains objectionable ingredients, may, with modern appliances, add to the supply of the country. Heat treatment of iron ores also increases the available supply by sintering or nodulizing finely comminuted material and driving off sulphur and volatile matter.

Developments of the Future

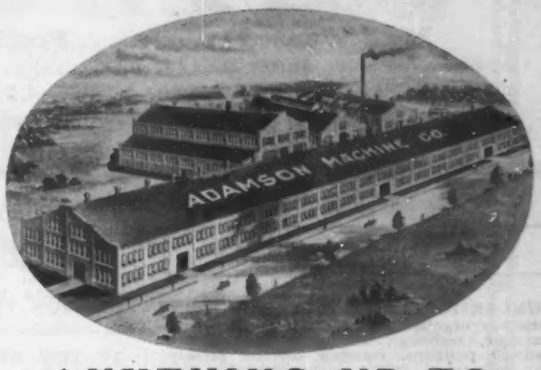
Most estimates of iron ore reserves assume that the present processes of smelting and conversion are to continue. Marvelous progress has been made in perfecting these processes, quantity and quality of product being obtained at costs far below those of a few decades ago, and this advance may be expected to continue, with possibly even more radical changes in the future than have heretofore taken place. The blast furnace has been the accepted appliance for producing iron for centuries, but the plant at the present time is quite different from one of even 50 years ago, not only in the quantity produced but in the materials used, the practice followed and the resultant economies. It is possible that another 50 years may so change the smelting process as practically to eliminate the blast furnace, and in estimating the iron ore reserves we should consider that new methods may be employed for using ores which are now considered relatively undesirable.

The production of ferric alloys of titanium, phosphorus, chromium, silicon, manganese, etc., warrant the expectation that these may grow in importance and that some ores in which the above or other elements are prominent may be in much demand, for in many lines of industry steels of specific composition, in which some of the rarer elements are alloyed, are sought and the production of such steels has already reached an important volume. For such purposes ores of which iron is the base, but which are at present lightly esteemed because of other items of composition, may be sought and liberally employed.

While in the United States the electrical furnace has been primarily applied to refining steel, the possibilities of electrical smelting may command attention, especially where rich ores can be treated with electricity developed by water power or by fuel at low cost, a possibility influenced by the highly economic operation of turbo-generators.

Considering the various features above enumerated and remembering how much of our mineral wealth remains to be proven, there would seem to be little ground for anxiety as to the future supply of iron ores for the United States.

CONVERTER STEEL CASTINGS



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